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Young Electricians

CONTRACTORS' LABOUR PROBLEMS

ONE problem which has vexed the electrical contracting industry for some years has been that relating to the employment of youths under twenty-one years of age. By an agreement arrived at in 1943 these youths were placed in three categories: the first covered indentured apprentices, the second unindentured youths, with a somewhat similar standing, and the third " casual " youths.

Temporary Measure

The Electrical Trades Union was not in favour of the employment of boy labour other than apprentices but agreed to the setting up of Category III as a temporary means of regulating wages for this class of worker. The matter was raised before the National Arbitration Tribunal recently when the E.T.U. contended that both sides of the National Joint Industrial Council for the Electrical Contracting Industry had agreed in principle, before 1943, to the discontinuance of boy labour other than apprentices and were in favour of the gradual elimination of Category III.

The Union asserted that the employers' side was not prepared to take steps to secure this on the ground that it was at present impracticable to fix a date after which no more Category III youths would be engaged. The Union did not desire to force these youths to leave the industry at once; it was suggested that their elimination should be spread over a period of five years.

Linked with this question is that of the ratio of apprentices to qualified journeymen. The Union wishes to see a limitation of entrants to the industry which, it told the Tribunal, is at present not subject to control. It expressed the view that there should be only one apprentice to every five journeymen on the job; any further assistants should be adult mates who could be recruited largely from the present Category III.

No Lack of Employment

It was implied by the National Federated Electrical Association that the Union need have no fear of lack of employment for its members as for years the demand for qualified electricians had exceeded the supply. Therefore there was no case for departing from the proportional arrangement, which had operated since 1921, of one unskilled youth or man for each journeyman electrician, with allowance for special cases.

This certainly seems to be more reasonable than the expensive ratio suggested by the Union and it is not

surprising that the N.F.E.A. suggested that it would cause havoc to the present structure of the industry if it were adopted.

In its award (reported on page 480) the Tribunal ruled that Category III recruitment should cease at the end of this year. The ratio question was left unsolved; the Tribunal decided to hand it back to the two parties involved " to keep under constant review and determined in the light of the working of the new apprenticeship scheme."

It is, of course, the Union's endeavour to impart a " scarcity value " to electricians but in this it errs. There is no reason to believe that there will be a lack of electrical installation work in the long run. Any temporary check caused by the pressure of immediate circumstances will only be accentuated by action which increases costs and lowers " output."

MONOPOLIES REPORT

A great deal of time has been spent by the Monopolies Commission on investigating alleged restrictive practices in six fields. Only one report has been issued so far, another is on the way and four others (including those on electric lamps and cables) are expected to be published by the end of this year. The Board of Trade has received many suggestions for reference to the Commission but in its report the B.O.T. says that the mention of an industry in this connection involves no adverse imputation or " stigma." If these suggestions are proceeded with the rest of the electrical industry will be implicated for now we notice " heavy electrical equipment " has been added to the list of possible subjects and the item " electrical accessories " which appeared in the Board of Trade's first report has become " electrical *appliances* and accessories."

MINING GEAR

Five months ago we commented on the illogicality of mixed installations of flameproof and non-flameproof equipment underground in mines. At about the same time the National Coal Board, Production Department, issued an information bulletin (*Electrical Review*, 29th September, 1950) which indicated how money might be saved by the use underground of non-flameproof gear, of suitable types, in situations where it could legally be installed. It seemed evident enough that the purpose of the bulletin (No. EE (50) 4) was to advocate economy, not the introduction of dangerous apparatus. Nevertheless there appears to have been some misunderstanding of the N.C.B. policy in this respect, so a supplement to the bulletin has been issued which makes it clear that safety must not in any circumstances be prejudiced for the sake of economy. The sensible thing to do when in doubt is to ensure safety first, which is not the same as always choosing the most expensive equipment.

COAL PRICES

In our report last week on the revision of the B.E.A. bulk supply tariff to Area Boards, it was pointed out that the 2 per cent average overall increase was apart from the effect of the recent rise of 4s 2d per ton in the general price of coal. It is not clear whether, yet again, the whole of the rise is to be imposed on the electricity supply industry. In that case the reduction of 0·005 per kWh in the running component of the tariff would be small compensation for the addition of 0·035d to meet the additional fuel cost. The vicious characteristic of these flat-rate increases without regard to heat value is that they discourage the use of the poorer classes of coal, since it is now more economical to burn higher grades.

CYCLONE FURNACES

The trend towards the adoption of the unit system of one turbine to each boiler has not been followed in the new Ridgeway power station (Chicago), the main particulars of which appear on page 496, as the 150 MW turbo-alternators take nearly 1½ million lb/hr of steam each. Coal for the cyclone furnaces is not pulverized, but crushed to ¼in size. This system is claimed to minimize fouling of the boiler tubes and exit gases. Electrostatic precipitators have, nevertheless, been installed. One British boiler of this type, which will be cyclone fired, is in the early stages of construction. It will be the first of its kind in this country and is designed for the Barking " C " power station. Crushed coal will be employed, 95 per cent below ¼in, which means that all will be less than ⅛in size. This boiler will have an m.c.r. rating of 540,000 lb/hr at 950 lb/sq in and 940 deg F at the superheater outlet.

Stainless Steels

Modern Electrical Applications to Strip and Sheet Production

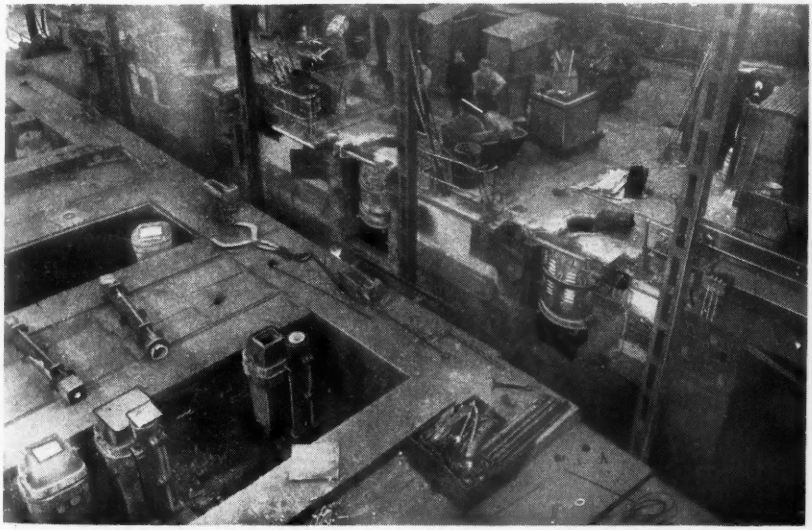
THE object of this article is to describe the modern electrical applications to the production of stainless steel strip and sheet as we have recently seen them at the works at Stocksbridge of Samuel Fox & Co., Ltd. It is true that most of the modern machines relate to the later stages of production, but certain recent modifications to the existing plant for the earlier processes (mainly furnaces) make it desirable to outline the processes from the beginning, i.e., from the melting of the raw materials which are, in the main, scrap steels with the addition of the necessary alloy materials such as chrome, nickel, tungsten and molybdenum, varying in amount according to the products required.

The melting is carried out in open hearth, high-frequency and electrode arc furnaces, and while, of course, the principal electrical interest lies in the h.f. and arc furnaces, the open hearth furnaces are being modernized by the application of electronic control for the regulation of gas and air flow, with recording pyrometers for measuring the temperatures at the roof and other strategic points in each furnace.

There are four h.f. furnaces in the main plant, each of two tons capacity and with an electrical loading of 625 kVA at 1,125 c/s. Each pair of these furnaces is supplied by a double-generator motor-generator set, the driving motor being a 1,875 h.p., 1,500 r.p.m., 11 kV synchronous machine. The motors are designed to operate at 0·83 leading power factor at full load, and they thus correct the p.f. for the works electrical installation. The furnaces are controlled by hand or semi-automatically, and the melting of a complete charge takes about 2½ hours.

While both the h.f. and the arc furnaces are employed in the production of alloy steels generally, the trend is to use h.f. furnaces for the production of the higher grades of steel which demand the larger

Each of the 2 ton h.f. furnaces has a loading of 625 kVA at 1,125 c/s



percentages of the rarer alloy materials. There are two arc furnaces, each nominally of 10 tons capacity, but they are usually charged with 12 tons of material. The furnaces are worked as far as possible on a six-hour cycle, the actual melting and refining time being about 5½ hours.

Each furnace is fitted with a rotating hearth which can be so arranged as to dispose the charge under the electrodes at different points from time to time, thereby assisting to give rapid and even melting. This feature is also applicable to refining when a molten bath has been obtained, whereby a certain amount of turbulence of the molten steel is created to ensure more complete mixing of the constituents of the steel. In order to charge the furnace, the hearth can be run out from under the roof thus enabling the furnace to be charged from a special basket suspended from an overhead crane. Each furnace is supplied by a 3,500 kVA, 11 kV, transformer with secondary tappings which provide an electrode voltage range of from 220 to 97. All the movements of the furnace, including roof raising and furnace tilting, are fully interlocked and controlled from a central room where the panels also provide indications of electrode current, voltage and power, e.h.v., current and tap positions, thus enabling the melter to operate the furnace under the best conditions.

One of the furnaces has recently been equipped with a new type of electrode control. In order to control the arc so as to provide the maximum power input to the furnace the electrodes are constrained to move nearer to or further from the charge under the control of the electrode current and the voltage difference between the charge and the electrodes, thereby maintaining an optimum arc length. This was previously achieved by differential relays and contactor gear; the new equipment employs a constantly running small four-unit m.g. set with a separate generator for each electrode. The armature of each generator is solid electrically connected to the armature of the associated electrode raising and lowering motor, whose field is permanently energized.

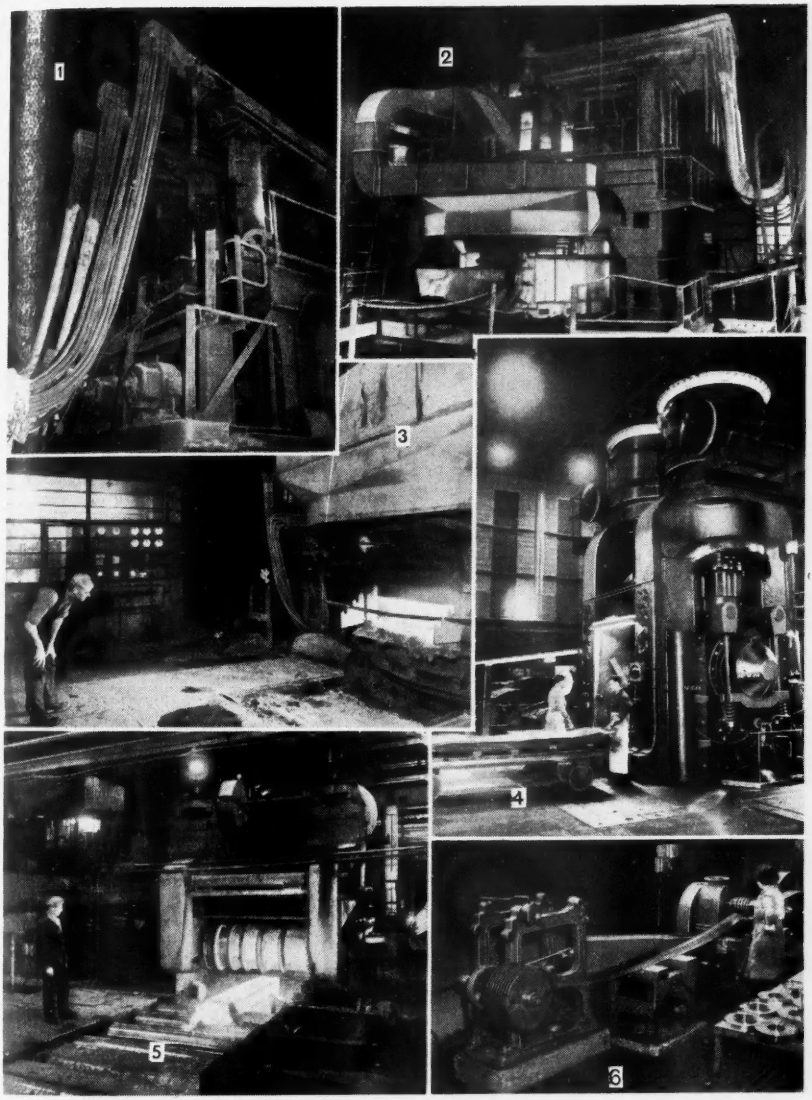
Each generator has two fields. The first is supplied by a rectifier which, in turn, is energized by a current transformer in the electrode circuit; the strength of this field thus varies in proportion to the electrode current. The second is supplied by another rectifier which is energized by a voltage transformer connected across the arc, i.e., between the electrode and the bath. The circuit conditions are such that when the arc is of the correct length the two generator fields are in opposition and neutralize one another, with the result that there is no generated voltage to cause the electrode motor to raise or lower the electrode. When the electrode current is reduced by the melting away of the charge, the voltage between electrode and bath increases, with the result that the strength of the first field is reduced and that of the second increased. Thus a voltage is generated in such a direction as to cause the electrode motor to lower the electrode until equilibrium is again attained. Conversely, if the current increases as the result of falling in of the scrap, the electrode is raised immediately to maintain the correct arc length.

The advantages of this "Rotodyne" system are quick response with little or no hunting, together with a perfect follow-through of the electrode as the charge gradually melts. All this results in reduced melting time, higher efficiency and improved refractory life. Further, the absence of moving components other than the rotating generator has resulted in considerably reduced maintenance.

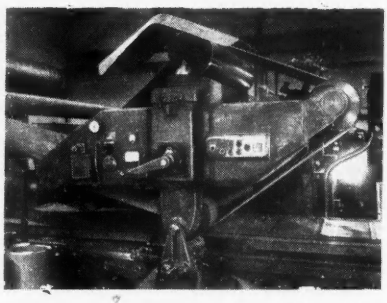
Strip Production

The charges contained in all the types of furnaces referred to above are poured into ladles and, in turn, into ingot moulds. The ingots, depending upon their type and the subsequent processing, may be hot charged directly into a reheating furnace in preparation for immediate rolling, or they may be allowed to cool under controlled conditions, after which they are either planed to remove surface defects or de-seamed. De-seaming consists of "swaging" the surfaces of the ingots with an oxy-acetylene flame, thereby "washing" off any surface cracks and defects without removing more than a negligible amount of the parent metal. This forms part of the important sequence of operations at every stage of manufacture by laboratory and inspection tests so necessary for these types of steels.

The cold ingots are next reheated in preparation for reducing them by rolling down to billets or slabs. The rolling is done in a conventional type of mill



(1) Electrode raising and lowering motors are served by the dual field generators of a four-unit m.g. set. (2) Each 10-ton electrode arc furnace has a rotating hearth to ensure rapid and even melting. (3) All movements of the arc furnace are governed from a central control room (left). (4) Sheets are cold rolled to final thickness at a total pressure of 2,500 tons. (5) The stainless steel ingot receives its first reduction to the billet in a two-high cogging mill. (6) Following the closely associated cold rolling, continuous grinding and annealing processes, the strip is trimmed and roller split to the required widths



In the endless abrasive belt polisher, belt positions are controlled by photo-electric cells

consisting of two-high cogging and finishing stands. The billets and slabs are hot sawn or sheared to length and are allowed to cool in air on the hot banks or under controlled temperature in pits. When cold the products of this mill are further examined for surface defects and are either chipped by pneumatic hammers or ground by swing grinders. The slabs are then sent forward for further hot rolling and cold rolling and finishing operations, while the billets are similarly forwarded for conversion into strip, wire, bars, etc.

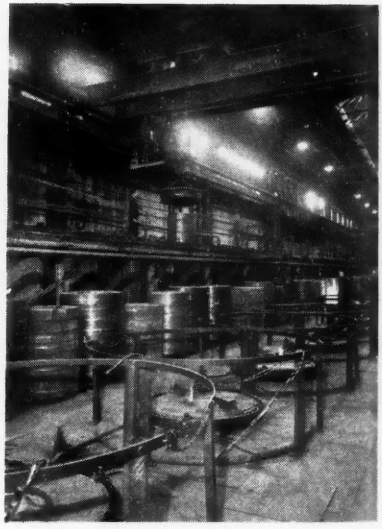
Hot rolled strip, which is produced by an associated firm, is de-scaled, pickled and normalized in a continuous process. It is passed on to the main cold rolling shop in the form of strip, about 6in wide and $\frac{1}{10}$in thick in coils weighing about 9 cwt each, and then subjected to several cold rolling operations to reduce it generally to a final thickness as low as 0·005in. In addition to some older four-high cold-rolling mills driven by 160 h.p. variable speed a.c. commutator motors, there are some recently installed Robertson four-high high-speed reversing mills in which the customary screw-down equipment is replaced by hydraulic pressure. Each of these mills has a 160 h.p. motor driving the rolls and a 30 h.p. motor driving each coiler. When used as an uncoiler, the motor acts as a generator to provide back tension. The three d.c. motors are supplied by a m.g. set under Ward Leonard control to provide for the exacting variable speed requirements.

The control operations are extremely simple. Apart from push-buttons for threading-up purposes, starting, stopping and speed variation are all done by a simple hand wheel which ensures very accurate and smooth operation. By means of a small knob the tension between the uncoiler and the mill on one side and the mill and the coiler on the other side can also be pre-set, so that constant values are maintained despite the variation in the diameters of the coils as the strip passes from one to the other.

The controls constitute a relay system which is governed by the coiler and uncoiler motor armature currents. This tension is necessary to ensure that the strip is rolled to the correct shape and thereby avoid such faults as waviness on the edges or at the middle as the result of uneven stretching. The mills are equipped with flying micrometers which continuously measure the thickness of the strip and so enable the operator to keep a constant check on the accuracy of the rolling. The complete electrical system, including the controls, was supplied by Lancashire Dynamo & Crypto, Ltd., and Allen West & Co., Ltd. In order to improve the tension control and to provide greater tension, an electronic control is to be installed, thereby ensuring the constancy of the product.

At an early stage in the cold rolling processes the strip is improved in quality by continuous grinding in a Hamilton strip

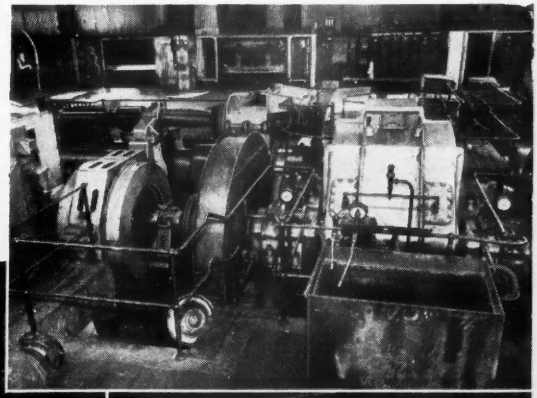
After each stage of cold rolling some of the coils of strip are annealed in 120 kW pit-type furnaces; pot charging in rear

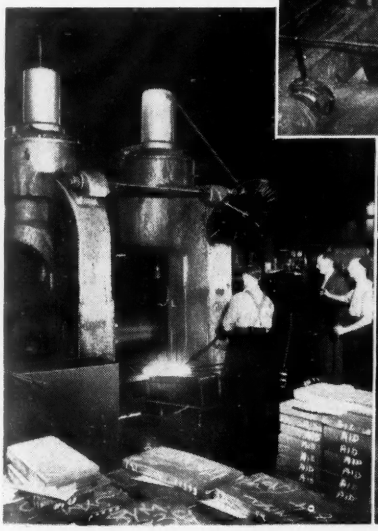


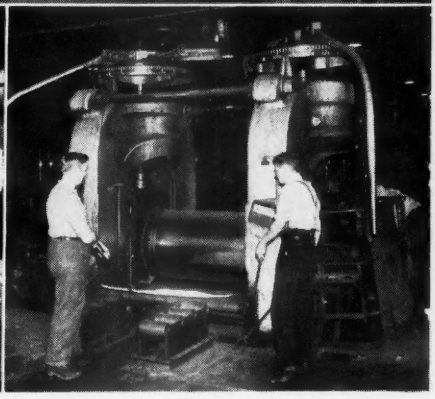
grinding machine which removes any shelf or deep pits caused by scale and not fully eliminated by the pickling. In this recently installed machine the strip is pulled through two oppositely rotating emery surfaced cylinders which are, in fact, inflated rubber bags with a replaceable outer covering. There are three stands in the machine, each equipped with grinding rolls of this type, and the strip is pulled through all the stands consecutively in a continuous operation. In order to avoid possible scratch lines the cylinders of each stand oscillate horizontally with two motions one fast and one slow, while the strip is maintained in one line position as it passes through the machine. In this way repeated grinding patterns are avoided.

Each grinding cylinder is driven by a direct-on-line 20 h.p. motor. Slip fluid is pumped continuously on to the strip and cylinders during grinding, and it afterwards flows away to a drain around the machine, together with the swarf, whence it is led to a large settling tank from which the fluid is again recirculated by a 50 h.p. motor driven pump. In order to increase the surface area of the strip in contact with abrasive cylinders, motor operated jockey rollers over and under which the strip runs on either side of the cylinders, respectively, throw the strip out of line vertically. The machine is about 65ft long and at the feeding and delivery ends are uncoiling and coiling machines driven by 30 h.p. motors, with heavy gear transmissions, while tension is applied at the rear end by roller flatteners.

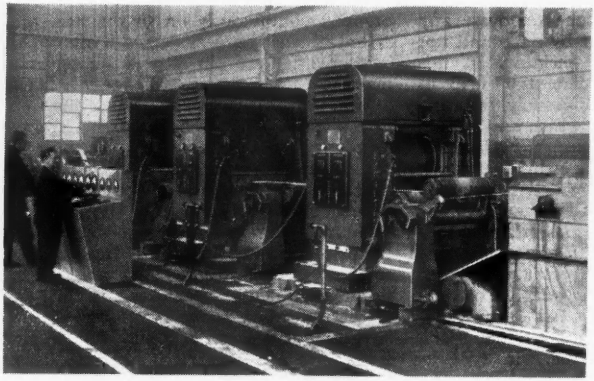
Owing to the work-hardening properties of special steels it is necessary to anneal the







Stainless steel slabs from the cogging mill are reduced to sheets in roughing and finishing hot rolling mills with a centrally situated common 750 h.p. drive



At an early stage in the cold rolling the quality of the strip is improved by continuous grinding in a machine with three stands

strip frequently after cold rolling reductions, either in batteries of electric pit type furnaces or in continuous bright annealing furnaces.

An imposing installation of pit type annealing furnaces comprises twenty-five G.E.C. and Birlec equipments, each loaded at about 120 kW, aligned in one very long shop. The coils of the strip are loaded on to stands, and each complete assembly, i.e., stand and vertical bank of coils, is lowered into a gastight pot. The loaded pots are then lowered into the furnace which is mainly below floor level. Neutral gas is fed into the pot during the heating and subsequent cooling to prevent scaling. Thus when the strip is removed from the pot it is still bright.

The continuous annealing furnaces, which were made on site, each have a loading of 250 kW and are provided with uncoilers and coilers at the feeding and delivery ends, respectively, so that up to three 6in wide strips or more narrower ones may be run through the furnace and annealed continuously, again in a neutral atmosphere. As each coil is unwound its tail is welded to the leading end of a new coil, thus securing continuous operation.

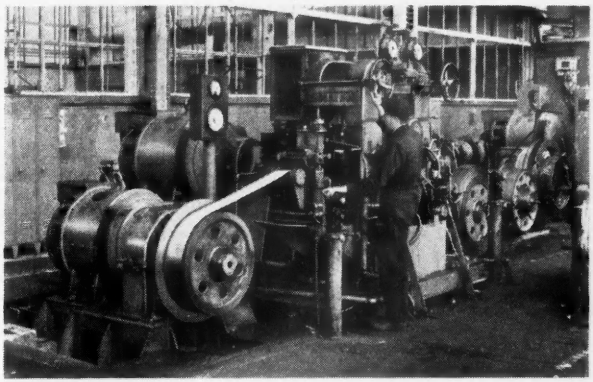
Following the closely associated cold rolling, continuous grinding and annealing processes the strip is passed on to slitting machines which trim the edges and cut the remainder into the widths required for the final products by means of roller cutters. Each slitting machine has its associated uncoiler and coiler, and is driven by a 5 h.p. motor. In the required widths and thicknesses the strip material thus produced constitutes the raw material for many wares.

Sheet Production

For the production of stainless steel sheet the slabs produced by the cogging mill, after they have had any defects ground out, are treated in a reheating furnace in preparation for hot rolling into sheet. This last process is carried out in two stages. First, the sheet gets its primary shaping from the slab in a two-high rolling mill, and then, after further reheating it is again reduced in a two-high finishing mill. These two Davy United mills are driven by an English Electric 750 h.p. 3,300 V slip ring motor centrally situated near the shaft common to the two mills. The transmission is through heavy type enclosed gearing with an overall reduction ratio of from 600 to 30 r.p.m. The sheets are then finally annealed in a vertical furnace below ground level before they are pickled or de-scaled.

Cold rolling to the final thickness and surface finish is the next process. This is carried out in an imposing mill, some 20ft high, which can exert a total pressure of 2,500 tons on the sheet. The mill has two work rolls each 18in in diameter by 48in wide, and two backing rolls each with a diameter of 56in. The main driving motor is a 500 h.p. variable speed d.c. machine. The screw-downs are motor operated in association with a Selsyn remote indicating gauge with pointers moving over a dial 3ft in diameter. All the motors are contactor operated from a control desk adjacent to the mill. The motors and control gear are of B.T.H. manufacture.

The sheets from the cold rolling mill, after being softened and flattened, are passed to the polishing shops where they are treated for surface finishes ranging from matt to mirror. Two of several types of polishing machines are of special interest. One is a Craven machine which was designed jointly by the manufacturers and



On the 160 h.p. motor driven cold rolling strip mill the usual screw-down equipment is replaced by hydraulic pressure

the steel company. It is a mop type equipment with specially designed hydraulically operated oscillating gear which imparts axial movements to the mop head. Each of these machines is driven by a 40 h.p. a.c. motor.

The other type is the Mattison in which an endless abrasive belt runs about four horizontal rollers so placed that the edge-on profile of the whole assembly is the conventional diamond shape. Under the lowest roller the horizontally disposed sheet is moved to and fro by a table driven by an oil hydraulic motor while it is kept in contact with the abrasive at the nip of the rolls by a "billy" roll immediately underneath it. An ingenious use is made of photo-electric cells operating on the edge of the endless belt, causing the upper roller to oscillate in order to keep the belt central on the rolls. A 40 h.p. a.c. motor serves each Mattison polisher.

After final examination, cutting to size and wrapping, the sheets are ready for despatch. They are finally used for such purposes as pasteurizing plants for milk, tanks and barrels for the brewing, chemical and oil industries, aircraft, hospital plant and domestic sinks.

We are indebted to Mr. O. Inman, director and chief engineer, Samuel Fox & Co., Ltd., for permission to visit the works and to publish this article, and to Mr. L. C. Bunce, electrical engineer, and Mr. W. L. Reick, assistant electrical engineer, for their help in obtaining information and photographs.

Monopolies Commission

THE Board of Trade has issued its second annual report on the working of the Monopolies and Restrictive Practices (Inquiry and Control) Act, 1948 (H.M. Stationery Office, 6d). This report, it should be noted, is not *by* the Monopolies Commission, but *upon* it.

The period covered is the calendar year 1950. During the year six investigations have been proceeded with, including those into the supply of electric filament and discharge lamps and the supply of insulated wires and cables. One report has been published—that on dental equipment—and the second, on certain builders' castings, is expected soon. The Commission hopes to report on the other four subjects by the end of this year. Work is beginning on investigations into the supply of semi-manufactured products of certain non-ferrous metals and insulin.

An appendix to the report shows that these non-ferrous products include brass and copper rods and extruded sections, brass and copper strip, copper sheets and circles, copper wire, copper tubes, and copper tapes, bindings and jointing sleeves.

A list is given of suggestions and requests made to the Board of Trade for investigations by the Commission. One relating to electrical accessories was mentioned in the first report, but to this has been added appliances. In this case and in that of radio batteries (a new reference) it was alleged that restrictive arrangements impaired competition in distribution, usually by limiting the availability of supplies to new entrants or by the discriminatory use of discounts or margins.

The only other electrical reference is to heavy electrical equipment, the suggestion for investigation deriving from allegations that the supply is "subject to the influence of restrictive associations to the extent required to bring them within the scope of the Act."

The cost of the Commission, borne on the Board of Trade vote, was £32,741 in 1949–50 and £20,401 in the first six months of 1950–51. The cost of common services is excluded.

Progress in Uganda

Construction Work at Owen Falls

FROM the 1950 annual report of the Uganda Electricity Board, a copy of which has been received from Kampala, it is learned that construction of the Owen Falls hydro-electric scheme is proceeding according to schedule. An important factor in facilitating this progress has been the foresight shown in arranging for the advance building of living quarters for both African labour and the supervisory staff. At the end of December the Owen Falls Construction Co. employed some 170 European and 34 Asian artisans, African employees numbering 1,650.

The principal permanent work during the year was on the power station and intake dams, rock excavation being carried to well below water level. During the latter part of the year coffer dam construction was carried out and a small section of the bed of the Nile was dewatered on 29th December. The main coffer dam will be built in two halves. As soon as the concrete foundations have been built in the western half the river will be diverted through temporary openings and the coffer dams will be removed and re-erected on the eastern half of the river. A temporary barrier at Rippon Falls will control the flow of the Nile should the lake rise above a certain level (the Egyptian Government has agreed to the Board's restricting the river flow, if necessary, during construction to 600 cu m/sec).

Model tests on the design of the sluices for the main dam carried out at Imperial College, London, under the direction of Professor G. M. White, confirmed that the consulting engineers' design was satisfactory. The models also enabled the amount of water which will pass through the completed sluices to be accurately calibrated.

The Board last year accepted an offer by the contractors to carry out the concrete foundations for the remaining six turbines (four only were included in the original contract). Including plant items to be provided by other contractors, the estimated extra cost is £343,000.

Altogether the Board's capital expenditure at the end of 1950 amounted to £3,648,709, of which £1,999,730 was incurred during the year. In addition, capital commitments estimated at £6,000,000 have been entered into, made up as follows:—Civil engineering work at Owen Falls, £3,620,000; four 21,000 h.p. turbines, £750,000; four 15,000 kW alternators, £600,000; housing, £100,000; switchgear, transformers, etc., £480,000; diesel engines, £150,000; and intake gates and associated equipment, £300,000.

With regard to the general activities of the Board, of which Mr. C. R. Westlake is chairman, the report refers to the steadily growing demand for electricity despite tariff increases which came into force last June. In two districts the lighting flat rates were reduced and this enabled standard tariffs to be applied throughout the area. Consideration has been given to the tariffs which will be applied after the commissioning of the Owen Falls plant and the Board hopes to be in a position shortly to negotiate rates for large power supplies.

Two additional Harland & Wolff 940 kW diesel sets were installed at Kampala "B" and four similar sets at Jinja "B" (now renamed Njeru) power stations. At Mbale three Paxman 220 kW and one Crossley 150 kW sets were commissioned and a fourth Paxman set was in course of installation. The Board anticipates that it will be able to meet all demands in the period up to the inauguration of the Owen Falls plant.

Transmission lines brought into use included 11 kV lines from Kampala to Namulonge (28 miles) and Jinja to Lugazi (26 miles) and a 33 kV line from Mbale to Tororo (31 miles). A 66 kV line from Jinja to Kampala and a 33 kV line from Jinja to Tororo were under construction and the route of a second line from Kampala to Entebbe was being surveyed.

A total of 16·5 million kWh was generated and 13·8 million kWh sold during 1950, compared with 10·8 million and 8·8 million, respectively, in 1949. Consumers at the end of December numbered 5,298 (against 4,143).

Choice of Fuels

HOG fuel (chipped wood saw mill refuse), wet bark and oil can all be used in the new power plant of the British Columbia Pulp & Paper Co. at Woodfibre, B.C. Provision was also made in the boiler design for changing over to coal if necessary. Energy produced by the boiler plant is used for the power requirements of the mill. Because the pulpwood is seaborne, there is a slag problem in burning the hog fuel. This slag, caused by the salt compounds in the wood, forms a dry powder-like coating on the heating surfaces of the boilers and superheaters. Special provision is made in the hog fuel boilers to keep the heat release low and to reduce the gas velocity. Cinder collectors are installed ahead of the induced-draught fans to prevent the contamination of the pulp and to utilize the combustibles in the fly-ash. Two boilers are equipped to burn hog fuel and one to use oil fuel exclusively.

Canadian Cable Contracts

Orders from Ontario and Quebec Hydro-Electric Commissions

It is announced by Enfield Cables, Ltd., that they are now manufacturing for installation during 1951 in Canada, 115 kV and 120 kV compression cables under two separate contracts recently awarded. The value of these two installations, taken together, amounts to more than $1,000,000, of which sum $800,000 will come to Britain in return for goods supplied and services rendered.

The smaller of the contracts, from the Hydro-Electric Power Commission of Ontario, is for the supply and installation of a 115 kV 3-core pipe line compression cable to carry a full load of 125 MVA at 100 per cent load factor. The cable will run for the most part along Fleet Street and Keating Street in the City of Toronto itself between Don Fleet Junction and the Toronto Esplanade terminal station, a route length of some 6,000ft.

Ontario Cable Specification

Details of this cable are: conductor 1,000,000 circular mil (91/·105) oval section screened with carbon papers; impregnated paper insulation thickness 0·32in ($S_{max.}$=110 kV/cm); reinforced diaphragm lead sheath (0·08in thickness), and skid wires to facilitate pulling are to be applied to each core before laying up. The three oval cores are to be laid up together and drawn into a steel pipe line. Single-core self-contained compression cable of the same conductor size with an outer pressure-retaining sheath, reinforced both circumferentially and longitudinally and protected against corrosion by Enfield patented rubber "sandwich," will be used for the tails for terminating the pipe line cable.

Seven straight-through joints, two trifurcating joints, six sealing ends with semi-conducting glaze to be supplied by Taylor, Tunnicliff & Co., Ltd., as well as gas feeding and terminal equipment will be required. The steel pipes of 6⅝in outside diameter and 0·188in wall thickness are being purchased from Page-Hersey Tubes, Ltd., of Toronto. Excavation and reinstatement will be carried out by G. M. Gest & Co., Ltd., of Montreal. The laying of the pipes, pulling in the cables and making the joints will be done by Henry Ihle, Inc., of Flushing, New York. Enfield engineers from England will supervise the work. The consulting engineer for this project is Mr. Harold Hobson, of London.

The Commission decided to lay a second steel pipe line in one continuous length in the same trench with the first cable to save future excavations, the additional cable to be pulled in subsequently when load conditions demand. Meanwhile the spare pipe will be charged and maintained with gas at a low pressure.

St. Lawrence Crossing

The second and larger contract came from the Quebec Hydro-Electric Commission, Montreal, for the supply only of some 100,000ft of 120 kV single core self-contained compression cable, to be laid four cables in parallel, one 3-phase circuit plus a spare cable, over a route length of 25,000ft, part of which includes the Jacques Cartier Bridge constructed 20 years ago to carry road traffic across the River St. Lawrence between the mainland and Montreal Island. The St. Lawrence is about 1½ miles wide at this point, 1,000 miles from the sea. The bridge is 8,520ft long, supported on masonry piers and for the first part connects the south shore of the mainland to St. Helen's Island, which divides the river into two parts. The first waterway is shallow and not navigable. The other part is the main navigable channel between St. Helen's Island and Montreal Island which the steel framed bridge crosses in a single span of 2,000ft with 163ft clearance to allow the passage of ocean liners.

Details of these cables are: conductor 850,000 c. mil (91/·097) for land cable and 650,000 c. mil (61/·103) for bridge section, oval section screened with carbon papers; impregnated paper insulation thickness based on $S_{max.}$=100 kV/cm; reinforced diaphragm lead sheath (0·08in thickness) and circular pressure-retaining sheath (0·10in thickness) with circumferential and

longitudinal reinforcements, protected overall with " sandwich " finish. Drum lengths of 750ft are specified for the land sections and 2,000ft for the bridge, to reduce the number of joints in this instance. Nearly 140 straight-through joints, eight porcelain insulators of the stabilized glaze type, together with gas feeding and terminal equipment will also be supplied. The excavations, installation and jointing will be done by the same organizations retained for the Toronto installation, but they will be directly responsible to the Commission with supervision by Enfield engineers.

The land sections of cables on either side of the bridge will be pulled into transite ducts; on the bridge the cables will be laid in transite trays. Installation and maintenance will, owing to the local conditions, present many difficulties. Extremes of temperature will be considerable (−29 deg F to +95 deg F) and constant vibration caused by traffic on the bridge as well as by wind and weather may result in fatigue and ultimate failure of the lead sheaths.

The bridge cables will have a diaphragm sheath of commercially pure lead and a pressure-retaining sheath of alloy " D " (0·5 per cent antimony, 0·25 per cent cadmium). A modified rubber " sandwich " will also provide some degree of cushioning against vibration.

Both these compression cable installations must be ready for service before the winter of 1951.

Contractors' Labour

Category III Youths and Apprentices

AN award has been made by the National Arbitration Tribunal in a dispute between members of the National Federated Electrical Association and certain workers employed by them, members of the Electrical Trades Union. The difference arose out of a claim concerning the future employment of " Category III " labour in the electrical contracting industry and the ratio of apprentices to journeymen electricians. Category III labour comprises workers under 21 years of age who are engaged without any undertaking by the employer other than the payment of agreed wages and whose employment can be terminated at any time subject to the usual notice. Categories I and II cover, respectively, indentured apprentices and youths who although unindentured are given training and a certificate of competence at the end of a stated term.

It was agreed in 1943 that the amount of unskilled labour should generally not exceed one to each fully-paid journeyman. In 1949 it was made clear that both sides of the industry were agreed upon the desirability of the gradual elimination of Category III labour. The employees contended that in spite of this the employers held that it was impracticable at present to fix a date after which no more Category III youths would be engaged.

The men's Union further raised the question of the proportion of unskilled to skilled labour and claimed that there should be only one apprentice to every five journeymen on a job; any further assistants should be adult mates.

Against this the N.F.E.A. contended that conditions in the industry necessitated a higher ratio of unskilled to skilled labour than in other sections of the building industry. The Union had given no indication as to the source from which extra adult mates to replace Category III labour could be recruited. The demand for qualified journeymen electricians had exceeded the supply for a number of years and the free flow of apprentices into the industry in recent years had barely kept pace with the progress of the industry. The restricted recruitment suggested would not meet the ever-growing needs for skilled electrical operatives.

In its award the Tribunal decides that no further Category III workers shall be engaged after 31st December next. As regards the proportion of apprentices to journeymen the Tribunal states that the evidence submitted was insufficient to enable it to fix a ratio. " This is a matter to be kept in constant review by the parties and determined in the light of their experience of the working of the new apprenticeship scheme."

The award (No. 1611) is available from H.M. Stationery Office, price 2d.

I.E.E. North Midland Centre

THE annual dinner and dance of the North Midland Centre of the Institution of Electrical Engineers will be held on 20th April at the Grand Hotel, Harrogate. Tickets 25s single, 50s double; students or graduates 17s 6d each, 35s double, can be obtained from Mr. T. G. Bridgwood, Electrical Engineering Department, the University, Leeds, 2.

VIEWS on the NEWS

By REFLECTOR

LAST Saturday the television "Picture Page" included a demonstration of some of the items shown at the first Ideal Home Exhibition (1908). I found the most interesting appliance to be the earliest vacuum cleaner devised by Mr. H. C. Booth which formed the beginning of a great industry. This had a vertical canister from which protruded a flexible hose and nozzle. Motive power was provided by a large handwheel from which there was a belt drive to the fan shaft. The demonstration showed that little effort was required to operate the cleaner and that its suction was quite powerful. Other interesting exhibits were an example of the old "sausage" fire with two 250 W carbon filament lamps and a very Edwardian Jackson cooker.

* * *

When I read in the *Beacon* (the magazine of the North Western Division of the B.E.A.) a report of the visit of a local Labour M.P. to the Rawtenstall power station I did not turn a hair. It seemed to say the usual nice things that are called for on such occasions. Nevertheless the article has been seized on by the Press, locally and as far away as London, as a piece of political propaganda. Even the *Manchester Guardian*, which is usually unemotional, has brought its editorial guns to bear on our little contemporary. "No doubt," it says, "*Beacon* would give space just as generously to an Opposition M.P. But would it not be better if directors of nationalized public relations steered clear of party politics?" Far too solemn, I think. In a letter to the *Guardian* Mr. P. H. Flatt, the divisional secretary, has put the matter into truer perspective.

* * *

It is possible to appreciate and maybe sympathize with the motives which cause men to strike for higher wages but stoppages caused by the internecine warfare of trade unions are another matter. In the electrical industry there have been two of these lately. The first occurred at the Bromborough power station, Birkenhead, where construction has been held up by a cessation of work by 300 steel erectors because one of their number was in arrears with his union subscriptions. The other concerned electricians employed by the London Electricity Board. In this case the excuse for the strike was the employment of a labourer as an electrician's mate. This man, already a member of the Transport and General Workers' Union, declined to join the Electrical Trades Union. Thus the public interest has to suffer for these "matters of principle" with which it has no concern.

* * *

I have always had my suspicions of the reliability of complainants about power station emissions, although I am not saying that these emissions do not occur. This is the sort of thing I mean:—A correspondent to the *Yorkshire Evening News* recently complained of the grit emanating from the tall new chimney at Kirkstall (Leeds) power station. Mr. G. A. Vowles, the controller of the Yorkshire Division of the B.E.A., has since written to the paper pointing out that this chimney has, as yet, no boiler plant connected to it and its completion is not expected until next month. Mr. Vowles adds that by June an electrostatic grit-arresting plant will also be put into service.

* * *

Reverting to the sale of hired appliances at "bargain" prices, a friend has shown me a letter he has had from the Southern Electricity Board. He has had a hired cooker in service for about fifteen years and it is now offered to him for 19s, plus 10s for the wiring. The latter charge seems disproportionate and my friend says he is inclined to tell the Board that he will buy the cooker but not the wiring. He thinks that the Board would hardly consider recovery worth while.

DIESEL-ELECTRIC LOCOMOTIVES

AMONG the orders for diesel-electric locomotives recently received by the British Thomson-Houston Co., Ltd., 28 are for service in Australia. Ten shunting and transfer locomotives, each of 1,000 b.h.p. with an all-up weight of about 70 tons, are in hand for the New South Wales Government Railways, and 18 shunting locomotives, each rated at 400 b.h.p., are being built for the Western Australian Government Railways.

The main sub-contractor for the Western Australian locomotives is the Clayton Equipment Co., and they will be built at this company's works near Derby. The diesel engine on each locomotive will be a Paxman type 12-RPL, derated to 400 b.h.p. at 1,250 r.p.m. The locomotives have a Bo-Bo wheel arrangement; that is two two-axle bogies with all axles motored, giving the locomotives a maximum safe speed of 45 m.p.h.

The ten locomotives for New South Wales are designed for a maximum speed of 57 m.p.h. so that branch passenger trains can also be handled in addition to shunting duties. There are two engines per locomotive, each being a Paxman 12-RPH Series 2, rated at 500 h.p. The main sub-contractors are the Metropolitan-Cammell Carriage and Wagon Co., who are supplying the mechanical parts.

In conjunction with manufacturers of diesel engines and mechanical parts, the B.T.H. Co. has developed a number of motive power equipments for locomotives of widely differing sizes and for various duties, ranging from works shunting service to the much larger type of engine for hauling goods and passenger traffic. One of the smallest diesel-electric locomotives being built in Britain to-day is the Ruston/B.T.H. 28-ton, 155 h.p. locomotive, designed primarily for works shunting duty. Another diesel-electric shunter, specially designed for steelworks duty, is a 44-ton, 300 h.p. locomotive built by the Yorkshire Engine Co. A larger diesel-electric locomotive with B.T.H. electrical equipment, is one for mixed-traffic purposes on British Railways, which is rated at 827 h.p. and has a top speed of 70 m.p.h.

N.S.W. RAILWAY ELECTRIFICATION

IN connection with the further electrification of the New South Wales railway system, now being undertaken on the Sydney to Lithgow section, the Australian General Electric Pty., Ltd., has received an order for fifteen 4,000 kW rectifier units to be built by the British Thomson-Houston Co., Ltd. These units have a higher rating than any other traction units so far supplied and the rectifier portion will be built up of air-cooled pumpless rectifier cubicles operating in parallel and of the same type as those being supplied to the Victorian Railways.

The Sydney–Lithgow electrification extends about 94 miles from the centre of Sydney. After leaving Sydney the railway climbs to a height of about 3,200ft in 31·3 miles with gradients up to 1 in 33. The bulk of the heavy goods traffic moves down the grade into Sydney and during this part of the journey the locomotives will operate on regenerative braking. Resistances, part electronically and part relay controlled, are to be provided to dissipate the regenerated power; the B.T.H. Co. will supply three resistances capable of absorbing 7,850 kW and two others to absorb 3,450 kW.

The contract also includes the supply of 66 kV oil circuit-breakers and the automatic control gear for the rectifiers and loading resistance units. The whole contract is valued at about £500,000.

SIGN MAKERS' LUNCHEON

THE Electrical Sign Manufacturers' Association held its annual luncheon at the Café Royal, London, W.1, on Tuesday last. Mr. A. E. Beadnell (Elders Walker & Co., Ltd.), the chairman, presided, and after luncheon welcomed the Association's guests. He mentioned that the Association was now six years old. Originally the members were attached to the Master Sign Makers' Association, but they had decided that a purely electrical association was warranted. Mr. Beadnell said that he had been vice-chairman for the first four years and chairman for the last two. Now he was relinquishing office and he welcomed his successor in the chair, Mr. G. S. Campbell (Franco Signs, Ltd.).

RELAY SCHEME REJECTED

BY sixteen votes to thirteen the Eastbourne Council on Monday last rejected the request of E.M.I. Ltd., to be allowed to operate a radio rediffusion service in the town. The matter came before the Council last month but was referred back following an appeal by fourteen local radio traders. The Highways Committee decided against their appeal so the matter again came before the Council.

It was pointed out that if the recommendation were passed it would weaken the hands of the Council in its efforts to get better reception from the B.B.C. whose job it was to provide the service. Councillor Marshall said that the problem of better reception could only be solved by a regional station, which would be expensive and could not come for a long time; that was why the B.B.C. had told the applicants to go ahead with this scheme. The rediffusion company had offered shares to all the fourteen traders who were objecting.

PERSONAL and SOCIAL

News of Men and Women of the Industry

THE Court of Cable and Wireless, Ltd., announces that **Colonel Sir A. Stanley Angwin,** K.B.E., D.S.O., M.C., T.D., is to relinquish the appointment of chairman of Cable and Wireless, Ltd., to take up a post with the Commonwealth Telecommunications Board. He will be succeeded by **Major-General L. B. Nicholls,** C.B., C.B.E., now managing director of the company. **Mr. N. C. Chapling,** traffic manager, is appointed managing director. The appointments will take effect as from 1st April next. Sir Stanley Angwin was appointed chairman of the company in January, 1947, when the State acquired the company's share capital. He acted as expert adviser to the Government in the arbitration proceedings connected with the acquisition of the shares. His appointment to the Commonwealth Telecommunications Board carries the responsibility of acting as technical adviser to the Board, and will ensure that his influence is retained in shaping the policy of the Commonwealth overseas telegraph system.

Major-General Nicholls has been a director of the company since January, 1947, and managing director since April, 1950. He served during the war as Chief Signals Officer to Field Marshals Alexander, Montgomery and Maitland Wilson, and to General Eisenhower. Mr. Chapling has been traffic manager since January, 1947. He joined the Eastern & Associated Telegraph Companies at the age of fifteen and was transferred to Cable and Wireless, Ltd., when the company was formed in 1929.

Mr. R. H. Watts has resigned from the board of Hilger & Watts, Ltd., with effect from 24th January, and **Mr. A. H. Campbell,** M.A., A.M.I.E.E., has been co-opted to fill the vacancy.

Mr. D. P. S. Kane has been appointed manager of Halsey's Electric Co., Ltd. Mr. Kane joined the company in 1948, and was appointed buyer last year. He remains responsible for purchasing.

Mr. and **Mrs. E. E. Sharp** are arriving in England on 22nd March for a three months' holiday from South Africa, where they now reside. Their address in England will be c/o Mr. L. C. Sharp, Rowbarns Grange, East Horsley, Surrey.

Mr. J. W. F. Welch, M.I.E.E., tramway engineer to Wellington City Council since 1941, has been appointed chief engineer of the Auckland Transport Board.

Mr. C. J. Hocking, M.I.E.E., has been appointed the South Western Electricity Board's Sub-Area manager for Cornwall in succession to **Mr. A. C. Owen,** M.C., who will be retiring at the end of March after more than forty years' association with electricity supply in Cornwall.

Mr. Hocking, who was born in Plymouth in 1901, obtained his technical education in his native city and in 1919 joined the Plymouth Electricity Department. Up to 1928 his duties were mainly concerned with the maintenance and operation of the generating stations, and for the following ten years he was engaged on the transmission and distribution systems of the Plymouth undertaking. In 1938 he became deputy city electrical engineer and held this position until 1947 when he became city electrical engineer in succession to Mr. H. Midgley, M.Inst.C.E., M.I.E.E., who was appointed deputy chairman of the South Western Electricity Board some months before vesting date. Mr. Hocking subsequently became the Board's district manager at Plymouth and was also deputy manager of the Torquay and West Devon Sub-Area (now merged in the Devon Sub-Area). In October, 1949, Mr.

Col. Sir Stanley Angwin

Maj.-Gen. L. B. Nicholls

Mr. N. C. Chapling

Mr. A. C. Owen

Mr. C. J. Hocking

Hocking moved to the Board's head office at Bristol as deputy secretary (commercial policy).

Mr. Owen joined the Cornwall Electric Power Co. in 1910 as mains and substation superintendent, and apart from service in the 1914-18 war, when he was awarded the Military Cross, remained with that company until nationalization of the electricity supply industry. He was appointed chief distribution engineer in 1933 and general manager in 1939. Following nationalization he became Sub-Area manager for Cornwall.

Mr. J. E. Moody, A.M.I.E.E., district commercial engineer at Ashford (Kent Sub-Area), South Eastern Electricity Board, has been appointed to a similar position at Worthing with the S.E.E.B.

The Brightside Foundry & Engineering Co., Ltd. (Heating & Air Treatment Division) announces the appointment, as from 1st March, of **Mr. J. G. Johnson** as manager of its Manchester office at Palatine House, 76, Victoria Street, Manchester, 3. **Mr. H. S. Crump** is the manager of the Liverpool branch of the company.

A. Reyrolle & Co., Ltd., announce that they have made the following appointments which are effective from 1st March.—**Mr. O. A. Chrisp** becomes assistant contracts manager overseas and will in future devote his duties to the export side wholly. **Mr. A. T. Crawford,** B.Sc., A.M.I.E.E., is appointed assistant contracts manager home. **Mr. W. Fenwick,** M.I.E.E., is appointed district manager for the East Midlands area and will shortly establish an office for the company in Nottingham.

Mr. R. B. Greenwood, who is well known in the advertising world for his association with the national and technical advertising accounts of the General Electric Co., Ltd., has resigned from the company to become a founder-director of Marshall Green, Ltd., a new advertising agency with offices at 14a, Cavendish Place, London, W.1. (Tel. Langham 6571-2). His co-directors in the new enterprise will be **Messrs. A. W. Green** and **G. F. R. Marshall,** executives from the J. Arthur Rank organization.

The Institute of Welding has awarded the Sir William J. Larke medal for 1950 to **Mr. I. C. Fitch,** electrode development engineer in the Welding Department, Metropolitan-Vickers Electrical Co., Ltd., for his paper on "Arc Welding Electrodes—Their Uses and Abuses." The medal was presented to Mr. Fitch at the Institute in London on 28th February.

Mr. J. S. Turnbull, blade engineer in charge of the Precision Casting Shop of the Metropolitan-Vickers Electrical Co., at Trafford Park, has been awarded the Joseph Whitworth Prize for 1950 by the Institution of Mechanical Engineers for his paper on "The 'Lost Wax' Process of Precision Casting." The prize, to the value of £25, which is accompanied by a certificate bearing the seal of the Institution, is awarded annually for the best paper accepted by the Council on the subject of "Industrial Administration of Engineering Production."

Mr. K. W. Todd, of the Gas Turbine Department of the Metropolitan-Vickers Electrical Co., has been awarded an Institution of Mechanical Engineers prize to the value of £15, accompanied by a certificate bearing the seal of the Institution, for his paper on "Some Developments in Instrumentation for Air-flow Analysis."

Mr. Leslie Gamage, vice-chairman and joint managing director of the General Electric Co., Ltd., left London on 24th February by air en route to Ceylon, Australia and Malaya. He was accompanied by his wife, the Hon.

Mr. O. A. Chrisp

Mr. A. T. Crawford

Mr. W. Fenwick

Mr. Leslie Gamage. Before leaving the airport they were received by Mr. R. C. Pugh, O.B.E., the airport manager at Heathrow. Flying via Rome, Cairo, Karachi, Bombay and Colombo they intend to continue their journey to Australia on the s.s. *Orontes*, returning to this country by air on 29th April. Mr. Gamage proposes to visit B.G.E. branches and works in Sydney, Melbourne, Adelaide, Perth and Brisbane and will discuss mutual problems with Sir Harry Brown, chairman and joint managing director of the British General Electric Co. (Australia) and with Mr. E. Hirst, vice-chairman and joint managing director of the company.

Mr. E. G. Hebditch has been appointed manager, Montreal Area, of the British General Electric Co. (Canadian), Ltd. Mr. Hebditch joined the General Electric Co., Ltd., in 1920 and after three years' apprenticeship at the company's Witton Works was sent to Fraser & Chalmers, Ltd., at Erith, Kent, where he worked on the erection of turbo-alternator sets. In 1925 he joined the Malayan staff of the G.E.C. as branch engineer at Singapore and after managing various G.E.C. branches in Malaya was appointed chief engineer, G.E.C., Malaya in 1938. He left Malaya in 1946 to take up an appointment with Pirelli-General Cable Works, Ltd., at Southampton, as assistant sales manager. During 1950 he was chairman of the Mains Cable Manufacturers' Association (Supertension).

Mr. E. G. Hebditch

Ald. W. H. Roberts, who is employed by the Merseyside and North Wales Electricity Board, has been nominated to be the next Mayor of Bebington. He has been a member of the Council since 1932, was elected an alderman in 1947 and in the following year was made a Cheshire magistrate.

The annual dinner of **Abell & Smith's Electrical Co., Ltd.,** was held on 28th February. In responding to the toast of the company proposed by Mr. C. R. Knott, Mr. G. C. Tysoe (director), referred to the competition from Electricity Boards, and said that competition had always been severe, but it had materially increased with the presence of the Boards. If they slackened their efforts an enormous amount of business would "go the other way." The Area Boards had big advantages, and their company had to be able to offer the consumer a price that compared favourably with the competition against them. The toast of the visitors was proposed by Mr. Wilkinson, and Mr. C. J. W. Scott, director of Crompton Parkinson, Ltd., and Mr. R. H. Phillips, Birmingham manager of the G.E.C., responded. Mr. H. Horton Smith (managing director), presented long-service certificates to Mr. R. Jones and Mr. A. I. Blizard.

The Old N'Ions, the Past Students' Association of the Northampton Engineering College, St. John Street, London, E.C.1., have issued a calendar, available on written application to Mr. A. N. D. Kerr, hon. secretary, 421, Grand Buildings, Strand, London, W.C.2. The president this year is **Col. J. Reading,** M.B.E., B.Sc.(Eng.), M.I.E.E., who is staff engineer in the Equipment Branch of the Engineer-in-Chief's Office, G.P.O., and is secretary of the Institution of Post Office Electrical Engineers.

The Amateur Dramatic Section of the Victoria Works Athletic Club (**Johnson & Phillips, Ltd.**), last week presented "Easy Money," a comedy by Arnold Ridley. The play was produced by Mr. S. Lund. Among the audience was Mr. W. Glass, joint managing director of the company.

OBITUARY

Mr. A. J. Leyland.—The death occurred on 26th February of Mr. Arthur James Leyland, joint general manager of Automatic Telephone & Electric Co., Ltd., and director of British Telecommunications Research, Ltd. Mr. Leyland was educated at the Manchester School of Technology where he obtained the degree of B.Sc.Tech. in 1920. He began his career in electrical engineering with the General Electric Co. (Peel Conner Telephone Co.), Coventry, and joined the Automatic Telephone Manufacturing Co., Ltd., in 1923. For several years he was closely concerned with the design, manufacture and installation of automatic telephone equipment, including the major project of equipping the London network with director equipment. For the next ten years he was actively engaged in furthering the company's overseas interests and was resident engineer in Buenos Aires from 1928-29, Antwerp in 1931, Poland from 1931-32, Lithuania in 1933 and from 1934-39 he was European technical engineer for telephone schemes in Belgium, Poland, Lithuania, Denmark, Latvia and Russia. In 1939 he became chief engineer of

The late Mr. A. J. Leyland

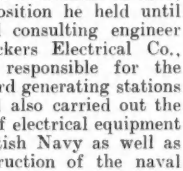
the Liverpool company and was appointed to the board in 1943.

Mr. W. T. Bower, Sutton Coldfield, Midland representative for Drake & Gorham, Wholesale, Ltd., for over twenty-five years, has died.

Sir James Scott Pringle, K.C.B., a former Director of Electrical Engineering to the Admiralty, died on 27th February at the age of seventy-five. Sir James joined the Admiralty service in 1903 and took charge of electrical work at Malta Dockyard. In 1919 he was appointed Assistant Director of Dockyards for electrical work and later Electrical Engineering at the Admiralty, a became Director of his retirement in 1945, position he held until when he was appointed consulting engineer to the Metropolitan-Vickers Electrical Co., Ltd. Sir James was responsible for the modernization of dockyard generating stations and supply systems, and also carried out the design and installation of electrical equipment of all ships in the British Navy as well as that used in the construction of the naval dockyard at Singapore. One of his sons, Dr. P. Pringle, is chief medical officer to the British Electricity Authority.

The late Sir James Pringle

Mr. F. C. Knowles.—The death occurred on 4th March of Frank Clements Knowles, M.I.E.E., in his 70th year. Mr. Knowles was sales manager to Evershed & Vignoles, Ltd., until 1949 when he retired from that position and was appointed a director of the company. Mr. Knowles was educated at the East London (now Queen Mary) College, and later specialized in electrical testing at University College, London. After gaining experience with W. T. Henley's Telegraph Works Co., Ltd., and Foxcroft & Duncan, Dalston, he joined Evershed & Vignoles in 1900. In 1911 he became technical assistant to the late Mr. E. B. Vignoles, the managing director, and was appointed sales manager in 1923. Mr. Knowles was a past chairman of the I.E.E. Measurements Section and a former president of the London Branch of the Association of Mining Electrical & Mechanical Engineers. He was a founder member of the Society of Instrument Technology and served on its first Council.



The late Mr. F. C. Knowles

WILLS

Mr. C. W. Clarke, A.C.I.S., assistant secretary to the former Callender's Cable and Construction Co., Ltd., who died on 14th December last, left £2,103 gross (£2,007 net).

Mr. T. F. W. Lincoln, late engineer and manager of Yarmouth Radio Relays, Ltd., and director of an associated company, Radio Relay Industries, Ltd., managing director of Home Radio (Lowestoft), Ltd., and Lincoln & Egerton, Ltd., who died on 4th May last, intestate, left £4,457 gross (£3,682 net).

South Midland Centre Jubilee

ON Tuesday, 27th February, the Birmingham Local Centre of the Institution of Electrical Engineers celebrated the fiftieth anniversary of its opening meeting at which the chairman's address was given by Sir Oliver Lodge, who was then Vice-Chancellor of the University of Birmingham, To mark the occasion an exhibition is to be held in the examination hall of the College of Technology, Suffolk Street, Birmingham, where the exhibits displayed will demonstrate the development of engineering science and products during the past fifty years. It is to be opened by the Lord Mayor of Birmingham on 20th March, at 6 p.m., and will remain open each day until 31st March, excluding Good Friday, Saturday and Easter Monday, from 11 a.m. to 8.30 p.m. The Centre has also published an interesting 16 page booklet outlining the history of its development.

Atomic Energy School

AN atomic energy school to teach workers in industrial and medical laboratories how to use radioactive materials is to be set up at the Atomic Energy Research Establishment, Harwell. The first course, lasting six weeks, begins on 2nd April, and will be in charge of Dr. J. E. Johnston, of Harwell's Isotope Division.

Twelve students will be accepted on each course, which, after the first, will last for four weeks. The second and third courses are to begin on 15th May and 18th June. There will be from 12 to 18 lectures in the course, each given by a specialist from Harwell, and the syllabus will be varied to meet the needs of the majority of students present.

The fee for the course is £40 and living accommodation at one of the A.E.R.E. hostels for senior staff will be available at £5 5s per week. Laboratory coats, protective shoes and note-books will be provided. Further particulars are available from Dr. J. E. Johnston, Isotope Division, A.E.R.E., Harwell, Berks.

Cambridge Professorship

Electrical Manufacturers Endow Chair of Electrical Engineering

THE endowment of a Chair of Electrical Engineering at the University of Cambridge was prominent among the University's post-war requirements formulated in 1944. As there was a possibility that circumstances might prevent the plan being put into force sufficiently quickly after the end of the war, the President and Council of the Institution of Electrical Engineers decided to offer to the University a sum of money which would provide for the establishment of a Professorship of Electrical Engineering for a limited period of five years in order that the Chair might be established without delay pending the completion of arrangements for a perpetual endowment. The Institution's offer was gratefully accepted by the Council of the Senate and the Professorship was established in November, 1944, and assigned to the Faculty of Engineering.

As the period of five years stipulated by the I.E.E. had expired, the Council of the British Electrical and Allied Manufacturers' Association, recognizing the important benefits that the electrical profession and industry derive from the Chair of Electrical Engineering, undertook to raise the money necessary for its permanent endowment. Accordingly the Association asked the University to accept a contribution of £71,000, this being the amount subscribed by member-firms of the B.E.A.M.A.

Permanent Endowment

The Council of the Senate, at its meeting on Monday last, recommended that the offer be gratefully accepted, and on the following day the Vice-Chancellor formally conveyed the Senate's acceptance and thanks to representatives of the B.E.A.M.A. and the I.E.E. The president of the B.E.A.M.A., Sir George Nelson, and the chairman, Mr. G. Leslie Wates, expressed to the Vice-Chancellor the gratification felt by B.E.A.M.A. members that the Chair of Electrical Engineering would now be permanently endowed and that it would make both full and lasting contributions to the advancement of electrical science and engineering.

The representatives of the B.E.A.M.A. and the I.E.E. were afterwards entertained to lunch by the Vice-Chancellor at Pembroke College, and among the guests were:—On behalf of the B.E.A.M.A.: Sir George Nelson, president; Sir Harry Railing, vice-president; Mr. G. Leslie Wates, J.P., chairman; Mr. B. H. Leeson, O.B.E., director; Mr. D. Maxwell Buist, export director; and the Hon. J. R. Rea, secretary. On behalf of the I.E.E.: Sir Archibald Gill, president; Sir Stanley Angwin, K.B.E., past-president; and Mr. W. K. Brasher, secretary. On behalf of the University, Mr. S. C. Roberts, Vice-Chancellor, and Master of Pembroke College; Col. Donald Portway, T.D., Master of St. Catharine's College and Lecturer in Engineering; Sir Charles Inglis, O.B.E., F.R.S., formerly Professor of Mechanical Sciences; Professor J. F. Baker, O.B.E., Professor of Mechanical Sciences; Professor H. S. Kirkaldy, Professor of Industrial Relations; Professor E. B. Moullin, Professor of Electrical Engineering; Dr. L. B. Turner, University Reader in Engineering; Mr. R. H. Angus, Lecturer in Engineering; Dr. R. F. Davies, Lecturer in Engineering; Mr. J. T. Spittle, formerly Lecturer in Engineering; and Dr. G. D. S. MacLellan, Demonstrator in Engineering.

List of Contributors

The following members of the B.E.A.M.A. contributed the £71,000:—

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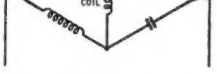
CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for the opinions expressed by correspondents.

Discriminative Load Shedding

THE article by Mr. G. T. Shears (16th February) interested me, as I have pondered the subject for some time.

I turned down the idea of control by voltage drop as not being suitable in practice. First, it would operate by the consumer's terminal voltage, which is not the same as station busbar voltage. Secondly, it would upset the control engineer's estimate of what load reduction a particular voltage drop would produce.



Fall-of-frequency load control

My suggestion is control by frequency drop. The accompanying diagram will indicate my method, which could be applied to any class of load.

Macclesfield. LEONARD BRADBURN

Inspection of Installations

UNTIL such time as the proposed National Inspection Council becomes established, I am afraid that Mr. Taunton's article more than fairly presents the existing situation. It should be quite apparent to those concerned that the Electricity Boards' contracting departments benefit in the following manner:—

(*a*) Greater liaison between installation and inspection departments.

(*b*) Time lag between completion of work and connection to mains considerably reduced.

(*c*) Inspection and installation departments controlled by same engineer.

One must admit that there will always be points of difference between the contracting and inspection sides, be it within or without the supply industry. That being so it is easy to see the benefit of point (*c*) to the installation department of the Board.

Pencombe, Hereford. R. D. QUAYLE

Discharge Lamp Chokes

Methods of Production Noise Testing

By C. A. MASON, B.Sc., M.I.E.E., A.M.I.Mech.E.
and D. A. NUTT, B.Sc., A.M.I.E.E.

In recent years there has been a big increase in discharge lamp lighting and particularly fluorescent lamp lighting. All forms of discharge lamp lighting require to be used in conjunction with a current limiter, which normally takes the form of a series inductance or a transformer with a large leakage reactance. The cores of such inductances or transformers are built in laminated form from transformer steels, and can exhibit the usual forms of noise radiated from cores of this construction.

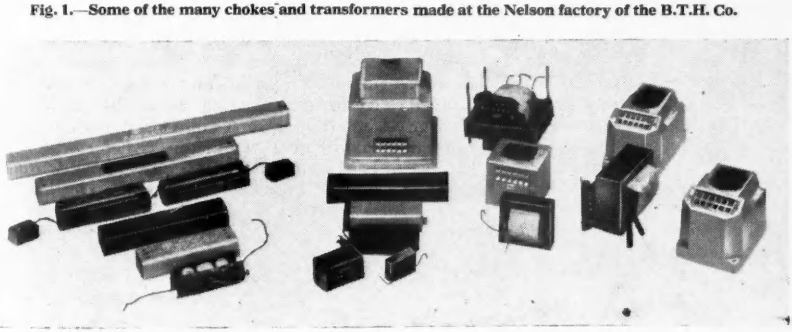
There are three effects which produce this noise. Joint noise is caused by varying forces between laminations, particularly where laminations are lap-jointed. In the case of magnetostriction noise periodic changes in flux density cause very small changes in the linear dimensions of the core, thereby causing sound to be radiated. Gap noise on the other hand is caused by pulsating magnetic forces across the air gap. The noise radiated is different in character from joint noise, since it is a result of the core vibrating as a single unit and not as a number of separate laminations.

Owing to the non-linear voltage/current relationships which exist for discharge lamps, the voltage and resultant flux changes in a ballast reactor will not be sinusoidal and the noise output may therefore contain high harmonics of 100 c/s (the fundamental noise frequency) and be very different in character from normal transformer hum. Owing to the small size of the units involved, the noise emitted is not very intense but may be sufficient to cause annoyance in very quiet situations, as may be experienced when fluorescent lighting is used for office and domestic purposes.

It is the purpose of this article to describe the ways in which the noise level of chokes made by the British Thomson-Houston Co., Ltd. (some of which are illustrated in Fig. 1) is checked during manufacture to ensure that none are marketed which have noise levels greater than that required for trouble free operation.

The human ear can detect a wide range of sound intensities, covering a range of 1 to 10^8. The sense of hearing tends to have a logarithmic rather than a linear response, so a logarithmic intensity scale is to be preferred. The unit used for this scale is the decibel, which equals $10 \log_{10} \frac{I_I}{I_O}$ where I_I is the sound intensity being

Fig. 1.—Some of the many chokes and transformers made at the Nelson factory of the B.T.H. Co.



measured and I_0 is the reference sound intensity.

A simple statement of physical intensity is, however, unsatisfactory for a complex noise as the ear is not equally sensitive at all frequencies. Accordingly a noise level is defined in terms of the intensity level of the equally loud 1,000 c/s note. The unit used is the "phon," which is the intensity level of the equally loud 1,000 c/s pure tone expressed in decibels above a reference intensity of 10^{-16} W/sq cm. This latter figure corresponds to the threshold of hearing at 1,000 c/s for the average observer.

It has been found that if the noise level of a choke measured by itself in free space and at a distance of 6in does not exceed 20 phons satisfactory operation will usually be obtained under service conditions. It is desirable therefore that chokes despatched from the factory shall not exceed this figure. This requirement has entailed the development of a noise test technique which is applicable to a factory production line and capable of handling about 1,000 chokes per day. Any method of test must be quick but definite in rejecting any chokes with a noise level exceeding 20 phons. After a period of some years the method of test described has been found to meet these requirements satisfactorily.

Subjective and Objective Methods

There are two main methods of measuring noise: the subjective and the objective methods. The subjective method employs a technique in which the operator listens to a standard reference tone of known intensity and adjusts it until it sounds as loud as the noise under investigation. Providing the measurement is made in a quiet situation, the only limit to the lowest levels which can be measured is the sensitivity of the ear. However, the assessment of noise levels by this method depends on the observer's judgment and is not very accurate. For results which can be relied upon to 2 phons it is necessary to use a large number of observers and average their results.

The objective method uses a microphone, calibrated amplifier and output meter. While this is simple in principle, there are a number of practical limitations to the use of the method, as no microphone-amplifier system is as sensitive as the ear. It is particularly necessary to use a microphone with a smooth frequency response, and the sensitivity of the microphone determines the lowest noise levels which can be measured. The lowest measurable noise level is limited by the point when the output voltage from the microphone becomes comparable with the voltage output due to thermal agitation in the first stage of the amplifier. At this stage it becomes impossible to make accurate measurements, and in order to meet this condition, specially sensitive microphones have been made.

Similarly, when the ambient sound level present at the location of the test equipment is of the same order as, or greater than, the noise output from the choke it is again not possible to make accurate measurements. By this method reasonably accurate measurements of noise level can be made; it has the advantage of not depending on the observer's judgment, the output meter indicating the noise level directly.

Neither of the above methods is suited to factory testing where the ambient sound level may be higher than the choke noise level. These difficulties have necessitated the adoption of an unorthodox inspection technique. Aural tests made in a quiet situation indicated that selection of quiet and noisy chokes could easily be made by ear if a standard choke were kept for reference comparison. Chokes having a noise level of 20 phons at a distance of 6in, which have been tested for stability with time and temperature, are used as reference standards, and all production chokes are checked aurally in comparison with them. When being tested for noise all chokes are run with a lamp so that actual working conditions are obtained.

It is evident that such a comparison cannot be made by ear alone in the factory, as the chokes cannot be heard above the ambient noise level. It is also evident that considerable difficulty and expense will be involved if an attempt is made to use only a sound insulating booth to reduce the factory noise. A noise level of 80–90 phons may exist in the factory, whereas the noise level from the choke is only 20 phons, and a massive structure would be required to give sufficient sound insulation. The test and reference chokes are therefore placed in a heavy plywood box of about 4cu ft capacity. No lining is used in the box but the chokes are mounted resiliently. The reverberation effects inside such a box due

to multiple reflections of sound give a considerable increase in the noise level from both chokes and also tend to give uniform distribution of sound within the box.

A microphone is placed in the box to pick up this sound, and for the latter reason the relative positions of microphone and chokes are comparatively unimportant. The microphone used is of a specially sensitive type and is connected to a low noise level amplifier terminating in headphones. The sound insulating properties of the box are increased by suspending it resiliently in a larger box and covering the outside of the inner box and the inside of the outer box with sound absorbing material (see Fig. 2). In order that the factory noise shall not interfere with the operator's judgment of the choke noise reproduced in the headphones, the complete test equipment is housed in a sound insulated booth giving an average sound attentuation of some 20–30 phons.

With such an arrangement it is possible for a semi-skilled operator to listen to a reference choke and a production choke on the telephones in rapid succession and so judge that the production choke is as quiet as the standard. A foot switch is provided for changing over from the reference choke to the production chokes. An attempt has been made to use an output meter in place of the headphones on these tests, but with little success, partly due to the longer time taken for the meter to settle down and partly to the inability of the meter to discriminate between choke and factory noise in the same way as the ear of the operator.

The method of testing described is entirely dependent upon the noise level of the reference choke and its stability. In order that a close check may be kept on the reference chokes a special room with lagged walls houses a test equipment capable of giving absolute noise measurements (see Fig. 3).

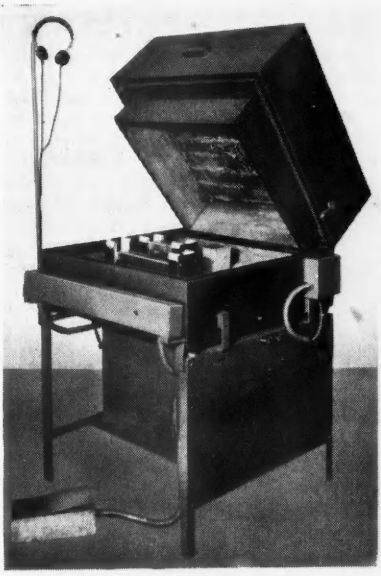


Fig. 2.—Factory type noise testing equipment

Fig. 3.—This lagged room houses equipment for absolute noise measurements

This objective noise testing equipment consists of a double box construction similar to that previously described, but in place of the microphone and amplifier used in the production line, a sound level meter which conforms to the Acoustical Society of America's standard specification* (no British standards having yet been issued) is used, consisting of a calibrated microphone and mains-driven low noise level amplifier terminated by a meter reading in phons.

This meter, which was designed and made by the B.T.H. Co., has a very low level of noise output and by using a specially sensitive microphone it is possible to measure noise levels down to about 10 phons. The absolute accuracy at this level is probably not better than $\pm$ 5 phons, but as the noise level rises the accuracy increases more rapidly and is probably better than $\pm$ 2 phons at a load of 20 phons. This degree of accuracy at these low noise levels is considered to be well within factory requirements.

In addition to the use of the objective test for checking reference chokes, it is used for checking the noise levels of experimental models and small scale production where the factory tests may not be wired for the particular type of choke. It is also used for testing high-frequency chokes of up to 2,000 c/s. Furthermore, all chokes rejected by the factory tests are re-tested on this equipment.

The authors are indebted to the British Thomson-Houston Co., Ltd., for permission to publish the information given in this article.

* American Standard:—Z24.3–1944.–Sound Level Meters for Measurement of Noise and other Sounds.

Large High-frequency Generator

Installation at Hatfield Works

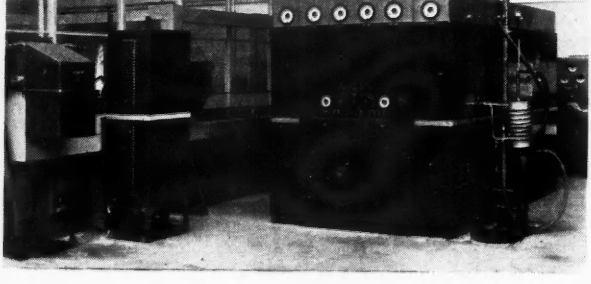
A HIGH-frequency induction heating generator with a maximum output of 150 kW (continuous) and 200 kW (intermittent) has been manufactured by Philips Electrical, Ltd., and installed at the Hatfield works of De Havilland Propellers, Ltd. This equipment, which is to be used for hardening purposes, is claimed to be the most powerful valve operated h.f. generator in Europe.

It is designed for operation on 380–440 V three-phase 50 c/s mains and requires a maximum mains power input of 280 kVA. At 150 kW output the power factor is 0·9 and the nominal operation frequency 275 kc/s. The built-in variable coupling transformer for "on load" control of output power is designed to allow for a choice of automatic or manual operation. Tapped h.v. secondary voltages are available.

The valve complement comprises one oscillator valve, one grid bias valve, and six rectifiers, the filament voltage of the oscillator valve being maintained constant by an automatic, motor-driven regulator. A wide choice of automatic operating-time ranges is provided by the fitting of two synchronous motor timers.

The equipment is about 7ft high, 4·5ft wide and 12ft deep, and weighs 3 tons. For ease of transport the heavy components are removable and the framework of the whole equipment divides into two sections.

All circuits are fully fused and fitted with adequate safety precautions; neon lamps indicate the satisfactory operation of interlock devices. A mains circuit breaker with calibrated overload trips and an interference suppressor are supplied with the equipment.



150 kW Philips h.f. generator at the Hatfield works of De Havilland Propellers

Industry and the House

Scarcity of Raw Materials

By F. J. ERROLL, M.A., A.M.I.E.E., M.P.

WHEN the shortage of raw materials for British industry and commerce was debated in the House of Commons on 2nd March, the Government found itself on the defensive. Although the debate was on the motion of a private Member, Mr. Russell, M.P. for Wembley South, the speeches were cast along party lines and the acceptance of the motion by a majority of four represented a moral defeat for the Government.

Mr. Russell moved that " In view of the growing shortage of many vital raw materials and its effect on the cost of living, employment, rearmament, and the export drive, the House regrets that steps were not taken earlier to build up substantial reserve stocks, and that more use is not made of private traders in ensuring continuity of supplies." The emphasis was thus on the mistakes of the past with an indication that private traders could have done better.

Depleted Stocks

Mr. Russell argued that while the Government took pride in increasing our gold and dollar reserves during 1950 by £575 million our stocks of vital raw materials were declining seriously. We now had only two tons of zinc for every three tons last year. As regards copper, stocks were now only 101,000 tons compared with 130,000 tons a year ago. Imports of special shapes of copper had fallen off. The same story could be told about aluminium. There was a delay in making purchases in Canada and as a result we imported last year only three tons for every four imported in 1949. Tin stocks had gone down from 16,000 tons in January, 1950, to 9,000 tons in January of this year. Supplies of wood pulp and other forms of paper-making material in stock were halved during the twelve months ended November, 1950.

Mr. Russell concluded by saying that bulk buying had its limitations. If traders were free to negotiate for their own supplies mistakes would be smaller and would be cancelled out by the successes of others.

Socialist M.P.s, led by Mr. Edelman, supported an amendment which welcomed the Government's intention to regulate world supplies of raw materials by international agreement. Mr. Edelman pointed out that the price of coal had risen by only 35 per cent in five years. The advances in the so-called free materials were very much greater. During the same period rubber had increased in price three and a half times and wool nearly seven times. Mr. Edelman reminded the House that rubber production costs were still only about 8½d per lb, but the selling price was about 6s per lb. He suggested that " the selling policy of the private interests concerned with rubber has no relationship whatsoever to national needs, but that they are exploiting the difficulties of the country and taking advantage of the economic position throughout the world."

The President of the Board of Trade gave a useful review of the position regarding several raw materials at the present time. He defended the Raw Cotton Commission which, faced with a reduced allocation of raw cotton from the United States, had turned its energies to the seeking of supplies elsewhere. He claimed that the advantage of centralized buying and, where appropriate, long-term contracts had made possible the procurement of increased supplies from the Sudan and East African countries.

Sulphur Supplies

The position with regard to sulphur and sulphuric acid was extremely serious. The Americans had drastically curtailed our allocation of sulphur and as a result there would be only a severely reduced supply of sulphuric acid for British industrial use during 1951. As regard stocks of non-ferrous metals, the policy had been to keep them up to a reasonable working level.

Mr. R. S. Hudson and Mr. Walter Fletcher concluded the Opposition's case. The former speaker blamed bulk purchase for most of the difficulties of to-day, while the latter suggested that the Government should have approached America for a barter arrangement whereby rubber might have been exchanged for cotton.

Two new Statutory Instruments, Nos. 275 and 277, have just been introduced by the Government prohibiting the use of certain non-ferrous metals in a long list of final products. Dislocation to industry and unemployment may well be caused by these Orders and it is probable that they will be debated before Easter on an Opposition Prayer.

PARLIAMENTARY NEWS

By Our Special Reporter

LAST week Mr. Harold Wilson, the President of the Board of Trade, speaking on a private member's motion in the House of Commons, warned the country that our internal problem was going to demand far more use of controls, whether statutory or voluntary. The position with regard to sulphur supplies was serious, and the Government had been working on a detailed allocation scheme for sulphur and sulphuric acid which was now ready for introduction. All this presented a very grave picture indeed. Unless the allocation was increased, while we should maintain supplies at as high a level as possible in steel production, oil refining, tinplate and certain other industries, there would be a serious reduction in the general chemical industry, and serious reduction indeed in the rayon industry and many others using both sulphur and sulphuric acid.

The Sulphur Commodity Committee was now sitting in Washington. The United States administration had been most helpful and understanding about our difficulties and he (Mr. Wilson) trusted that they would be able to increase the allocation by the 30,000 tons or so which we required—about 3 per cent of the total United States consumption.

It would have been wrong to offer hostages to fortune before Korea by building excessive stocks of non-ferrous metals when prices were going to fall. Directly or indirectly this would have cost scarce dollars. The Government's policy had been to maintain stocks at a normal working level. In the second half of last year the dollars were available but the materials were not.

Later, the private member's motion, which regretted that steps had not been taken earlier to build up substantial reserve stocks and that more use was not made of private traders in ensuring continuity of supplies, was carried, against the advice of the Government, by 167 votes to 163.

B.B.C. Reception

Replying to Mr. Grimond, the Postmaster General (Mr. Ness Edwards) said he understood from the B.B.C. that reception of the Scottish Home Service and the Light Programme should be reasonably satisfactory in both Orkney and Shetland.

E.C.A. Conference

AS we have already reported, the Golden Jubilee Conference of the Electrical Contractors' Association and its allied organizations is to be held at Harrogate from Monday, 28th May, to Wednesday, 30th May.

On the Monday morning there will be a meeting of the Council of the three Associations (E.C.A., N.E.C.T.A., Ltd., and N.F.E.A.) and delegates will register at the Majestic Hotel during the day. In the evening there will be a reception by the president (Mr. P. G. Wallis) and dancing.

The Conference will open on the Tuesday morning at the Royal Hall when delegates will be welcomed by the Mayor of Harrogate. Mr. Wallis will then deliver his presidential address and after this short papers (probably three) will be read and discussed. The discussion will be continued in the afternoon. A reception will be held by the Mayor in the evening.

Wednesday morning will open with the annual general meeting at which time will be provided for a general discussion of matters of Association interest. This will be followed by the installation of the new president who will deliver a short address. In the afternoon a garden party will be held and the proceedings will conclude with a smoking concert and dance in the evening.

Electricity Supply Handbook

THE fourth edition of the "Electricity Supply Handbook," published by the *Electrical Times*, Sardinia House, Sardinia Street, London, W.C.2, at 3s 6d, differs little in arrangement from the preceding edition. The text and the maps have been revised and a new map included of the 275 kV grid. The comparative data of the more important technical and financial statistics contained in the second B.E.A. report have been included. As in the previous edition, details of the personnel of the B.E.A. Divisions and the Electricity Boards are given and a considerable amount of information with regard to the B.E.A. plant programme, bulk tariff, electricity output, etc., is included, while the list of names and addresses of associations connected with the electrical industry is again given.

RAW MATERIAL SHORTAGES

Statements on Government Policy

SPEAKING at the Dollar Convention, organized by the Dollar Export Board, which opened at Eastbourne on 1st March, the Chancellor of the Exchequer (Mr. Hugh Gaitskell) appealed to the United States not to jeopardize the rearmament programmes of the Western European powers by building up excessive reserves of strategic raw materials. Mr. Gaitskell said that it was improbable that this country could raise its total production above the 1950 level and the burden of rearmament would be too heavy if production was actually reduced for want of the necessary materials. He stressed the fact that the Government considered that exports to the dollar markets were of equal importance to production for defence, but said there was a possibility that heavy engineering exports would have to be reduced. In that case the balance must be redressed largely by the export of consumer goods.

On the following day the Minister of Supply (Mr. G. Strauss) said that the Government did not intend to impose "wartime" controls on materials. It would rely on manufacturers to work out schemes of allocation and control under general guidance. He outlined the principles which would be followed by the Ministry of Supply in restricting the export of semi-finished metal goods. Mr. Strauss said that long-term agreements with the Rhodesias and other Commonwealth countries would ensure supplies of copper, aluminium and nickel for a long time ahead.

Mr. Harold Wilson, President of the Board of Trade, said that great importance was attached to the discussions now proceeding in Washington on the allocation of raw materials between the United States and its partners in the North Atlantic Community.

Licences for Export

On 21st February the Board of Trade and Ministry of Supply announced that from 1st March the production of various goods made from copper and zinc and their alloys would be prohibited. Arrangements have now been made for certain exemptions from this prohibition—particularly for goods for export. Applications to manufacture for export goods on the prohibited list should be made by the manufacturer who is either himself an established exporter of the goods or who seeks permission to produce the goods to the order of an established exporter. Applications for licences to manufacture should be made in writing to the Regional Offices of the Board of Trade or of the Ministry of Supply, depending under which Order the goods concerned are included.

Applications must normally satisfy the following tests:—(a) The export value (f.o.b.) of the finished goods, as compared with the value of the contained copper, brass, zinc or their alloys shows a conversion factor of (i) at least 15 times in the case of exports to the dollar area and sterling Commonwealth countries; (ii) at least 50 times in the case of exports to other markets. (b) It is established, by past trade, definite inquiries or from orders, that sales of the goods can be made and that the opportunities in the market are not purely temporary due to scarcity of metal in the importing country. (c) It is known that import licences, where these are required, will be granted.

In the case of exports to North America there may be applications which, although not satisfying these tests, may be granted by reason of special considerations justifying exceptional treatment. The issue of licences will also be considered for Government orders; articles for special purposes, for example for ships or for purposes where anti-corrosive material is a necessity either in the United Kingdom or in, for example, tropical countries; articles in which very small amounts of metal are needed for essential parts of articles; the use, after 30th June, of stocks of metal in a fabricated or partly processed state acquired by the manufacturer before 1st March (manufacturers, whether they wish to apply now, or expect to apply later, should as soon as possible send a statement of the quantity of metal in their possession in this form on 1st March or at a current date); metal for work in progress which is not quite finished.

Radio Engineers' Examination

THE next graduateship examination of the British Institution of Radio Engineers will be held from 16th to 18th May next at 38 centres throughout the world. Entries from home candidates must be lodged with the Institution by 1st April. Arrangements have already been made for 234 overseas candidates at centres in Australia, Canada, Guatemala, India, Malaya, New Zealand, Pakistan and South Africa. Further details and specimen examination papers may be obtained on application to the Secretary of the Institution, 9, Bedford Square, London, W.C.1.

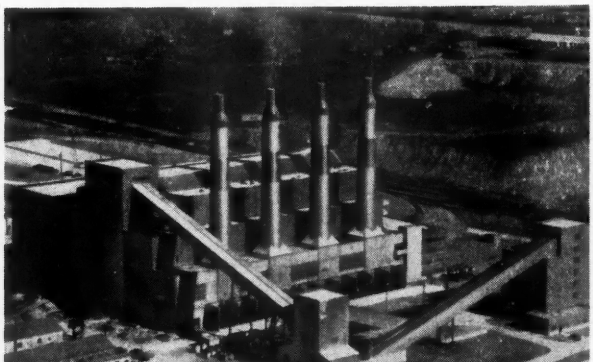
American 600 MW Power Station

Cyclone-Fuel Boilers

THE first 150 MW unit of Ridgeland power station of the Commonwealth Edison Co. was put into service at the end of last October; a second is scheduled for commissioning this year and two more will be added in 1953. Each of the first two units includes two 730,000 lb/hr cyclone-fuel boilers for steaming at 1,900 lb/sq in and 1,050 deg F.

Coal is brought by canal from the Illinois mines 200 miles from Chicago, but natural gas is also used when available. Combustion of the fuels, mixed in any proportions, is regulated electronically from a central point. The four boilers for the two sets will feed into a common header. Each cross-compound turbine consists of a 50,000 kW 3,600 r.p.m. high-pressure and a 100,000 kW 1,800 r.p.m. intermediate- and low-pressure element, but the latter can be independently operated at reduced pressure and temperature.

The 13·8 kV alternators are designed for 85 per cent power factor with hydrogen cooling at 0·5 lb/sq in and with 15 per cent higher rating at 15 lb/sq in. Each alternator has its own motor-driven exciter, with a third common to the two alternators of the unit. Auxiliaries (all electric, except one turbine-driven feed pump and oil pumps for the turbines) are supplied at 4·16 kV from two 8,000 kVA transformers connected directly to the alternator terminals or, in emergency, from the 69 kV busbars. Motors of from 50 to 3,500 h.p. are wound for 4,160 V and smaller motors for 208 V.



The Commonwealth Edison Co.'s Ridgeland power station

Batti-Wallahs' Lunch

THERE was a record attendance of 170, including many distinguished men from all branches of the electrical industry, at last week's luncheon of the Batti-Wallahs' Society to hear Earl Mountbatten of Burma speak on the transfer of power to India.

As the last Viceroy of India, Lord Mountbatten undertook the tremendous task of formulating a plan for the partition of India and the transfer of government to the people of India. Such an immense undertaking was fraught with difficulties, among which religious differences were prominent. Lord Mountbatten took over the post of Viceroy at a time when the situation in India had assumed a serious aspect and speed in solving the Indian problem was therefore of paramount importance. In his illuminating address Lord Mountbatten gave some indication as to how he persuaded the conflicting parties to come to agreement and the leaders of the political parties in this country to allow the Bill for the transfer of power to proceed through all its stages as an all-party Bill. He said he was satisfied that self-government by India and Pakistan had brought peace to the Indian people who now regarded the British with greater friendliness than at any time under British rule.

Commerce and Industry

F.B.I. and the Budget

New Telecommunications Company

IN its annual representation to the Chancellor of the Exchequer upon the Budget the Federation of British Industries expresses the opinion that rearmament can be carried through without an increase in taxation by economies in other expenditure. It is believed that £1,800 million could be saved during the next three years by cutting down central and local government expenditure. Among the proposals made are that reserves for depreciation of fixed assets on replacement costs and for replacement of stocks at higher prices should not be subject to tax; that the profits tax should be withdrawn; and that the burden of taxation should be shifted from production to consumption, involving an increase in indirect taxation which could be used as an instrument of restricting consumption where this is desirable.

Electrodepositors' Conference

The annual conference, including daily technical sessions at which papers are to be read, of the Electrodepositors' Technical Society is to take place at the Grand Hotel, Torquay, from 11th to 14th April. Further details are obtainable from the secretary, 27, Islington High Street, London, N.1.

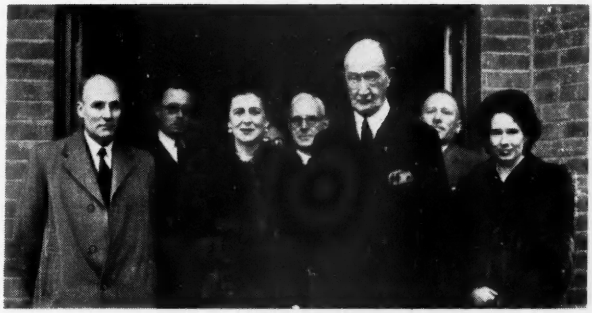
Royal Visit to Metal Works

The platinum smelter and refinery of Johnson, Matthey & Co., Ltd., at Brimsdown, Middlesex, which has recently been considerably extended, was visited on 22nd February by the Duchess of Kent. Her Royal Highness was conducted through the new plant by the chairman of the company, Mr. H. W. P. Matthey, and saw various stages in the smelting and refining of platinum and the other metals that comprise the platinum group — palladium, iridium, osmium, ruthenium and rhodium. She also visited the refinery of the company's associate, Johnson & Sons Smelting Works, Ltd., where, among other processes employed in the refining of gold and silver, she saw the treatment of demonetized silver coinage. At the conclusion of her tour, the Duchess was presented by Mr. Matthey with a jewelled compact in platinum and 18 carat gold alloy.

German Competition in Turkey

In its February *Monthly Trade Journal* the British Chamber of Commerce of Turkey says that during the past year it was very preoccupied with the question of the intense German competition which British and other foreign manufacturers were meeting in Turkey. German prices for all types of manufactured goods were considerably lower than British and delivery periods almost always shorter. In October last German underground electric cables were from 45 to 48 per cent cheaper than British and boiler plant 40 per cent cheaper. Although still dearer than German machines, British electric motors are gradually being given preference because of their longer life and better all-round quality.

There is now a tendency for German prices to rise and they may eventually reach British and other European levels. In the case of important capital equipment, however, such as



The Duchess of Kent at the Brimsdown refineries of Johnson, Matthey & Co., Ltd., and Johnson & Sons Smelting Works, Ltd.

Left to right: Mr. E. C. Deering (director, J.M.C.), Mr. Harley Suart (director, Johnson & Sons Smelting Works, Ltd.), the Duchess of Kent, Mr. T. Girtin (director, J.M.C.), Mr. H. W. P. Matthey (chairman, J.M.C.), Mr. G. Walker (general manager, J.M.C. Brimsdown refinery), and the Duchess's lady in waiting, the Countess of Birkenhead

power station plant, factory installations, etc., German manufacturers are still prepared to quote prices which seem to leave little or no margin of profit. It is presumed that in these cases they intend to recoup themselves by supplying spares, additional plant, etc., needed later.

Radiant Boiling Plates

Two window displays presenting "Redring" boiling plates have been produced for the use of retailers by the Metropolitan-Vickers Electrical Co., Ltd. One of these is illustrated. The company points out that this type of plate is becoming increasingly popular and has completely superseded the solid pattern in the United States. Most cooker makers now include at least one radiant plate as standard. Two well-illustrated and priced pamphlets have also been issued in this connection.

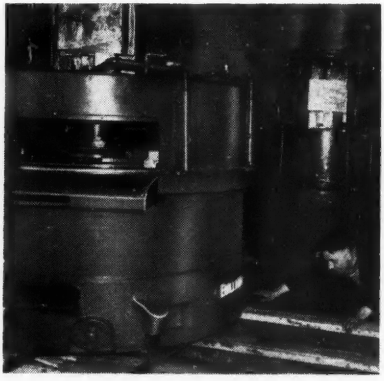
Another Thorn Acquisition

Thorn Electrical Industries, Ltd., announce that they have acquired the whole of the ordinary share capital of Smart & Brown (Engineers), Ltd., whose factory is situated on the Spennymoor Trading Estate, Co. Durham. The company manufactures "Hi-Craft" lighting fittings and control gear, switches, circuit breakers, electrical accessories, plastic moulded products and closures and engages in general engineering. It is the intention of Thorn Electrical Industries to continue the existing policy and to expand production at Spennymoor.

Motor Production Machines

New machines weighing 40 tons arrived at the Brook Motors Works, Huddersfield, last week from the United States. The machines are six-spindle automatics made by the Bullard Co. of Bridgeport, Connecticut. Three of them

A new Bullard machine at Brook Motors works



One of the Metrovick "Redring" window displays

will be used to machine at one operation the endshields of the new Brook "Brema" motors for which large orders have been received from America. Thus are dollars spent to gain dollars. All machining is done in a 1 min 55 sec cycle. The same operations in a turret lathe would take 17 min 30 sec.

Electricians' Working Week

Mention is made in the February *Electron* (the journal of the Electrical Trades Union) of a request by the National Federated Electrical Association that the 47-hour week agreement should be restored. The union's reply was that its policy was for the 40-hour week in five days. The journal says:—"More will no doubt be heard of this question in view of the declarations being made by the British Employers' Federation and the Government."

Cable for Australia

A contract has been obtained by W. T. Glover & Co., Ltd., for 20,000 yards of 0·25 sq in 3-core screened, pre-impregnated paper insulated cable for the Sydney County Council. The cable is lead sheathed single wire armoured, and for a working pressure of 33 kV.

Where the Money Goes

Prices and profits are a perennial topic of discussion but few people realize what is involved in the fixing of prices and the earning of a reasonable return. A useful pamphlet on the subject has been written by Mr. A. L. Johnson, M.A. (Richard Johnson, Clapham & Morris, Ltd.) in which he analyses very thoroughly the many charges which go to make up a manufacturer's "overheads" and studies the

questions of reserves, depreciation, taxation and dividends. Mr. Johnson also briefly surveys the position of the wholesaler, retailer and professional man in these matters—nor does he forget the nationalized industries. Copies of the pamphlet (" Who Profits ? ") are available from the Political Secretary, Constitutional Club, Northumberland Avenue, London, W.C.2 at 8s each (6d a copy above fifty). It should be said that the pamphlet is quite non-political.

Refrigeration Handbook

The 1951 edition of the " Handbook of British Refrigeration Material and Home and Overseas Buyers' Guide," has just been published by *Modern Refrigeration*, Empire House, St. Martin's-le-Grand, London, E.C.1, price 20s post free. In its 300 pages it reveals more strikingly than ever the rapid growth of the refrigeration industry. Firms' addresses in all sections of the trade are given, and the plant and accessories produced are listed and illustrated. Attention is also paid to the export markets, the various technical and trade organizations are dealt with, and a useful section of technical information and tables is included.

Housecraft Advisers' Conference

From Wednesday to Friday this week the annual conference of electrical housecraft advisers has been held at the Cowdray Hall, London, W.1. The programme included several papers on domestic subjects, demonstrations of cookery, etc., and the exhibition of E.D.A. films. The conference luncheon is being held to-day and the E.A.W. will be " at home " to delegates this afternoon.

Lighting Fittings

At the reopened showrooms, redecorated after enlargement by taking in what used to be office accommodation, at the Lighting Centre, 143, Knightsbridge, S.W.1—there is a stimulating display of fittings for interior illumination in the home and business premises. It is a comprehensive display, including new ranges in attractive styles, manufactured by Troughton & Young (Lighting), Ltd., an associated company of the parent engineering and contracting concern, which was formed after the war to conduct the lighting side of the business, with a design staff under the direction of Mr. A. B. Read, R.D.I., A.R.C.A., F.S.I.A., who was awarded the honour of Royal Designer for Industry in 1940 and is the present Master of the Faculty. The new ranges are noteworthy for their combination of appearance and effectiveness as practical light sources, a number of them having been selected by the Council of Industrial Design as exhibits for the Festival of Britain, both at the South Bank site in London and elsewhere. Many more have been chosen by architects and designers for their various buildings on the South Bank site, in addition to special fittings made for those buildings.

Part of the reopened showrooms of Troughton & Young

American Appliance Sales

Continued expansion in sales of domestic appliances in the United States during 1950 is revealed by a comprehensive analysis published in the January issue of *Electrical Merchandising*. Among the most popular appliances are: radio sets (of which 13,778,750 were sold), clocks (8,300,000), irons (7,475,000), television sets (6,900,000), refrigerators (6,200,000), toasters (4,525,000), washing machines (4,345,000), vacuum cleaners (3,730,000), fans (3,085,000), waffle irons and sandwich grills (2,535,000), shavers (2,150,000), cookers (1,830,000), heating pads (1,725,000), food mixers (1,700,000). Every classification shows an increase over the previous year's figures.

New Telecommunications Company

The directors of the Telegraph Construction & Maintenance Co., Ltd., and Mullard Electronic Products, Ltd., announce the formation of a new company to be known as Telcon Telecommunications, Ltd. The object is to promote and co-ordinate the development, manufacture and sale of " Telcon " cables and Mullard equipment associated with land line telecommunications. The registered office is at 22, Old Broad Street, London, E.C.2. The nominal capital of the company is £50,000 and

the issued capital will be held by Telcon and Mullard in equal proportions. The first directors are Messrs. J. N. Dean, J. Innes, and R. C. Mildner, representing Telcon, and Messrs. J. P. Jeffcock, C. L. G. Fairfield, and Dr. C. F. Bareford, representing Mullard. Mr. Dean, managing director of Telcon, is chairman of the new company. Mr. Jeffcock, who is vice-chairman, is commercial manager of Mullard's Equipment Division and a director of Mullard Equipment, Ltd., which specializes in the manufacture of telecommunications and scientific equipment. The managing director is Mr. Innes who, before joining the board of Telcon, was managing director of Cable & Wireless, Ltd. There will be available to the new company the technical resources and experience of the Philips Telecommunications organization in Holland, with whom Telcon has been closely associated for some time.

Prices of Materials

In the accompanying table we give the prices of the more important materials used in the electrical industry. The figures are those quoted on Monday last.

ALUMINIUM Ingots	ton £124 0s 0d
COPPER, H.C. Electro	ton £202 0s 0d
Fire Refined 99·7 per cent ..	ton £201 0s 0d
Fire Refined 99·2 per cent ..	ton £200 10s 0d
LEAD, English	ton £137 10s 0d
MERCURY	flask £73 10s 0d
TIN	ton £1,430 0s 0d
ZINC, G.O.B. Foreign	ton £151 0s 0d
Electrolytic	ton £155 0s 0d
BRASS Tubes	lb 1s 9½d
Sheet	lb 2s 1½d
Wire	lb 2s 3½d
COPPER Tubes	lb 1s 11½d
Sheet	ton £252 0s 0d
H.C. wire and strip	ton £226 10s 0d
PHOSPHOR BRONZE Wire	lb 3s 5½d
RUBBER, No. 1 R.S.S. spot ..	lb 73d

Radio Show

The Radio Industry Council announces that Queen Mary and Princess Elizabeth have consented to be patrons of the National Radio and Television Exhibition which is to be held this year at Earls Court, London, from 28th August to 8th September. The first day is to be "invitation day" for overseas and other special visitors, including the Press, and subject to his official duties, Earl Mountbatten will open the Exhibition to the public on 29th August. The change this year from Olympia to Earls Court has made available a larger floor space than ever before and the scope of the Exhibition has been broadened. In addition to covering every branch of the radio and electronic industry it will include gramophones, records and accessories, electro-medical equipment, electronic scientific instruments and test gear, and related products and services, including the trade and technical Press and "dealer aids." Emphasis in the Exhibition will be on export and visitors from overseas will be received at a bureau in the entrance hall and given all facilities, including the use of a special lounge. Invitations to the Show have already been distributed widely overseas and this is being followed by the publication in March of a 28-page booklet, "British Radio for the World," for overseas circulation only.

Plumber-Jointers' Pay Increase

The Joint Industrial Council for the Electrical Cable-making Industry announces that the rates of pay of plumber-jointers throughout the country are to be increased by 2d an hour from the third pay day in March in respect of the period covered by that pay day. There will be consequent increases in the wages of plumber-jointers' mates and of youths and boys. The new rates for plumber-jointers will therefore be 3s 5d an hour in the London area and 3s 1½d throughout the rest of the country. Mates' wages will be 2s 11d an hour in London and 2s 8d for the rest of the country.

Catering Exhibition Prizes

The North Western Division of the British Electricity Authority achieved a remarkable success at the Hotel and Catering Exhibition held in Manchester recently. The team won four first-prize silver medals out of a possible six in the individual competitors competition (industrial section). The medals were won by Mr. C. Klien, chief instructor; Miss A. Wells, assistant to the canteens manager; Mrs. M. Fidler, pastry cook, Stockport canteen; and Miss M. Shaw, canteen manageress.

Catalogues and Lists

General Electric Co., Ltd., Magnet House, Kingsway, London, W.C.2.—Priced and illustrated catalogue of lighting equipment entitled "Festive Lighting."

Belling & Co., Ltd., Bridge Works, Enfield, Middlesex.—Priced catalogue of electric fires and cookers.

Benjamin Electric, Ltd., Brantwood Road, London, N.17.—Priced folder describing a pocket-sized photometer.

Bulpitt & Sons, Ltd., Swansea Works, Birmingham, 1.—Folder announcing revised prices of "Swan Brand" domestic appliances.

Moulded Components (Jablo), Ltd., Mill Lane, Waddon, Croydon, Surrey.—Folder and leaflet on electrical and thermal insulating materials.

Marryat & Scott, Ltd., Wellington Works, Hounslow, Middlesex.—Comprehensive catalogue of electrically-operated lifts, in full colour.

Stores Lighting

Three Types of Lamps Compared

By E. W. SUMMERS

(General Manager, Courtney, Pope (Electrical), Ltd.)

Typical pendant fittings in a multi-department store in London

THE artificial illumination of multiple-department stores should be functional. Its main purpose is to enlarge the business turnover by attracting attention to the premises; it must create an interior atmosphere to which the public will want to return and in which the sales assistants will like to work. It must permit the merchandise to be normally displayed, without colour distortion, or appearing to be "bleached" with misapplied light, to enable shoppers to select properly.

The different characters of particular stores must be understood—their methods of selling, systems of presentation and classes of clientele for which they cater, all of which are determining factors. For these reasons store lighting cannot be standardized. In the bazaar type of store a high level of general illumination will suffice, if properly applied, perhaps with some perimeter lighting. The needs of the larger general-purpose store will vary from general to highly specialized display lighting and the soft intimate glow of the restaurant. Furthermore, customers can be guided to various departments by the proper placing of light, a fact which is often overlooked.

Surface mounted ceiling fittings in a women's clothing store in Sheffield

Fittings should not be chosen to attract customers' attention, or distract them by glare, but to direct light of the kind required where it is most needed. The modern sources now available make it possible to plan lighting in such a way as to impart character to different departments, so adding interest to the store

by creating an individuality, which could not be readily done when tungsten filament lamps were the only sources obtainable.

Better visual acuity and a sense of well-being result from using the higher levels of illumination now obtainable, without a material increase in the consumption of electricity, by the combination of fluorescent and tungsten lamps within correctly designed fittings.

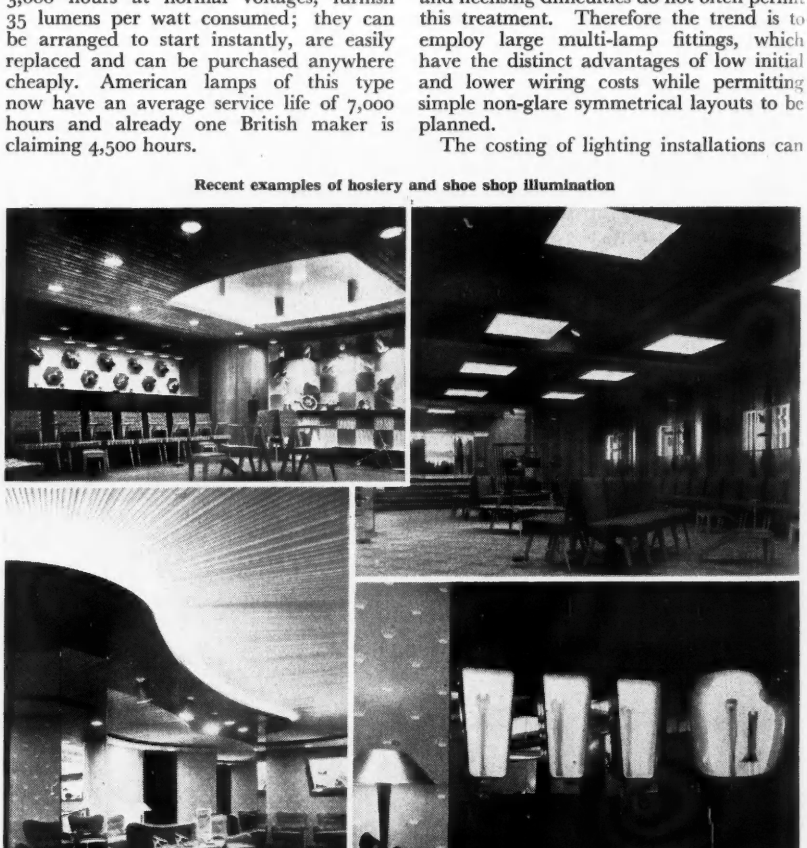
Hot-cathode lamps, which last about 3,000 hours at normal voltages, furnish 35 lumens per watt consumed; they can be arranged to start instantly, are easily replaced and can be purchased anywhere cheaply. American lamps of this type now have an average service life of 7,000 hours and already one British maker is claiming 4,500 hours.

Cold-cathode lamps, which last about 10,000 hours at very high voltages, furnish 27 l/W consumed; they start instantly, but cannot be replaced without skilled labour. They are not stock items, so are expensive and their length, usually 8ft, renders them liable to be broken when cleaning or handling.

Hot-cathode lighting in stores is perhaps best when it is possible to fit a false ceiling so that continuous lines of light may be built into it, although prevailing financial and licensing difficulties do not often permit this treatment. Therefore the trend is to employ large multi-lamp fittings, which have the distinct advantages of low initial and lower wiring costs while permitting simple non-glare symmetrical layouts to be planned.

The costing of lighting installations can

Recent examples of hosiery and shoe shop illumination



LIGHTING COST COMPARISON

Source	(1)	(2)	(3)
Average l/sq ft	20	20	20
kWh/10 years, 26,000 hr	52,000	23,920	26,000
Cost of energy	£216 13 4	£99 13 4	£108 6 8
Number of times lamps replaced, ten years ..	26	8·6	2·6
Cost of lamp replacements	£46 16 0	£83 17 0	£62 8 0
Initial cost of fittings	£30 0 0	£100 0 0	£208 0 0
Installation cost of wiring fittings	£16 0 0	£8 0 0	£16 0 0
Erection cost of fittings	£3 0 0	£6 0 0	£8 0 0
Cleaning fittings quarterly, ten years	£40 0 0	£60 0 0	£90 0 0
Total cost, one bay, ten years	£352 9 4	£357 10 4	£492 14 8
TOTAL COST, 25 bays, ten years	£8,811 13 4	£8,937 18 4	£12,318 6 8

be very complex and will vary with the kind of establishment. The simple basis on which the accompanying table has been compiled will suffice for comparison of the three main forms of lighting available to-day. It is assumed that electricity costs 1d/kWh; that the area to be illuminated is a basement consisting of 25 bays, each 25ft square (625 sq ft each); and that artificial light will be used for 50 hours per week.

The three sources compared are: (1) 500 W tungsten lamps in enclosed opal spheres, four per bay; (2) hot-cathode fluorescent " warm white " tubes in square fitting with metal sides, louvred underside, upward light and small cove round the louvre partially to illuminate the sides of the fitting, two per bay; (3) cold-cathode fluorescent " warm white " tubes, four of 9ft, with " Perspex " side screens and louvred underside, four per bay.

It should not be overlooked that the standing charge of a two-part tariff based on maximum demand for electricity is bound to be lower with fluorescent than with tungsten lamps and, moreover, that quality of light, which is extremely important in modern stores, is not always directly related to the cost involved.

Electricity in Shipbuilding

Commentary on Distribution Methods

AN informative paper on some aspects of the electrification of shipyards was recently presented by Mr. J. S. McCulloch (R. W. Gregory and Partners, consulting engineers) to the North East Coast Institution of Engineers and Shipbuilders. The paper was illustrated by network diagrams and loading graphs. It commenced by explaining why the cost of electricity was increasing and the reasons for load-shedding, with brief reference to the circumstances in which the installation of stand-by plant might be advisable, on all of which subjects the author has found a considerable amount of misconception generally as well as among shipbuilders.

The merits of a.c. distribution were discussed, with reference to system losses and operating costs. An interconnected distribution system was described which was suitable for welding on building berths, including a circuit diagram of a protective device for circuit interruption in the event of a dangerous potential difference occurring between the framework of an automatic welding machine and the ship in which it was used. The importance of proper earthing was stressed and the Factory Inspectors' requirements mentioned. Some results were given of tests which were made to determine the load and power factor of a group of welders on a distribution system. A vector diagram was developed to facilitate the forecasting of loading of this kind when designing a welding distribution network. Calculations for power factor correction and condenser switching were included in the paper.

The lighting of shipyards was described, both internally in shops and offices as well as outside stores and berths, with the aid of graphs which indicated when it becomes economical to employ fluorescent lamps relative to the number of hours of use annually. The paper concluded with details and illustrations of a complete scheme of outside lighting in one of the largest shipyards on Tyneside. On the assumption of 300 hours " burning " a year the cost per hour of use was expected to be less than £20, including depreciation, interest, maintenance, lamp replacement and cost of electricity. It was believed by the management of the yard that the advantages obtained by the high visibility provided during the hours of darkness would be worth more than the £20 per hour cost of electric light.

Birmingham Electric Club

SO large is the Birmingham Electric Club becoming that it is proposed to limit membership to 650. Over 400 members and their guests were present at the Club's thirty-fourth annual dinner held at the Grand Hotel, Birmingham, last Friday and applications for many more tickets had to refused.

Sir Arthur Smout, a director of Imperial Chemical Industries, Ltd., who proposed the toast of the Club, said that it enjoyed a high reputation in the city and was famed for its good work, especially in connection with technical education. He thought that those responsible for the electricity supply industry had done a first-class job. The much maligned electricity undertakings had played a major part in the recovery of the nation and could not be blamed for faults and failings for which they were not responsible.

Replying, Mr. A. T. Haywood, president of the Club, declared that the electrical industry in the Midlands was a smoother machine than was to be found anywhere else in the country. All branches were more welded together than in any other area. The Club's members met on common ground to sweep away any difficulties.

Responding to the toast of the guests proposed by Mr. G. F. Peirson, vice-president of the Club, Alderman W. S. Lewis, chairman of the Midlands Electricity Board, asserted that there was no shortage of generating plant. It was the boilers and buildings which ought to have been begun before April, 1948, that they were waiting for. The Midlands Electricity Board had a right to be proud of its achievements. In less than three years it had connected some 130,000 new consumers and 3,200 new farms. They faced colossal increases in prices over which they had no control and the extra charges to his own Board had reached £3,000,000 since it took over. These had not been passed on but in view of the higher bulk supply charges some increase in tariffs would have to be made. They were, however, going to take a risk and Midland consumers would probably be surprised at the very small increase in price that would be made.

Decentralization Problems

AT a meeting of the British Institute of Management on Tuesday last a paper was presented by Sir Henry Self, deputy-chairman (administration) of the British Electricity Authority, on "Problems of Decentralization in a Large-Scale Undertaking." Sir Henry began by outlining the development of the electricity supply industry before vesting day (1st April, 1948). He then proceeded to describe in some detail the central organization which had been set up since nationalization and the functions of the principal officers. He next dealt with the organization of the Electricity Boards, common services and consultative machinery.

The next section of the paper was a study of the central co-ordination of the industry which, on the face of things, is a movement away from regional decentralization. Sir Henry showed how compatibility between the two is achieved by periodical meetings of Board chairmen and the Boards' chief officers with representatives of the Central Authority. Next Sir Henry came to the Boards' own decentralization problems, describing the Sub-Area organizations, with their varying functions, and the responsibilities of the Districts. He concluded this section by acknowledging that all the difficulties had not yet been overcome but expressed his conviction that the B.E.A. and Boards were capable of working out the most practical and efficient solutions.

"National Programmes and Financial Control" was the heading of the next section in which the author explained the budgetary system employed and incidentally touched upon central purchasing—a matter in which, he said, the Authority endeavoured to ensure that the prices paid for plant were kept to a minimum. At the end of his summary of conclusions Sir Henry again stressed what he had emphasized in the paper, that the interest of the consumer was the paramount consideration.

N.P.L. Open Days

IT is announced that this year the National Physical Laboratory will hold "open days" for industrial representatives on 28th and 29th May, in conjunction with the Festival of Britain. The laboratory will be open on each day from 10.30 a.m. to 5.30 p.m. and luncheon and tea may be obtained on the premises. Accredited representatives of industrial organizations and others interested are invited to apply for tickets to the Director, National Physical Laboratory, Teddington, Middlesex, not later than 8th May, indicating on which of the two days they would prefer to visit the laboratory.

RECENT INTRODUCTIONS

NOTES ON NEW ELECTRICAL AND ALLIED PRODUCTS

Consumers' Control Units

THE new range of consumers' control units designed to B.S. 1454: 1948 which is offered by the MIDLAND ELECTRIC MANUFACTURING CO., LTD., M.E.M. Works, Reddings Lane, Birmingham, 11, includes circuit-fuse, main-switch and supply-intake units with service cable sealing chambers for twin paper-insulated lead-covered cables or 1¼in conduit. Composite units comprising 60 A double pole "Mem-ac" main switches with four and eight-way banks are also available in either cream enamelled steel or polished wood cases. The fuse banks will accommodate either rewirable or h.r.c. cartridge fuse carriers.

Oil-Filled Radiators for Marine Use

A new development in the oil-filled, hermetically sealed electrically heated radiators made by HURSEAL, LTD., 229, Regent Street, London, W.1, is a unit for marine or industrial use. While the construction is basically the same as that of the domestic models, these radiators have in addition an air- and water-tight connector box which encloses a thermal cut-out and condenser for d.c. working. They are principally made for bulkhead fixing.

Terminating Clamp

A terminating clamp for overhead power lines made by CABLE COVERS, LTD., St. Stephen's House, London, S.W.1, incorporates a ball and socket joint as an integral part of its body. The design is such that the trough in the body cannot retain water or excess moisture, no matter what its position may be. The conductor is simply pushed into the gripping device; tools are not required.

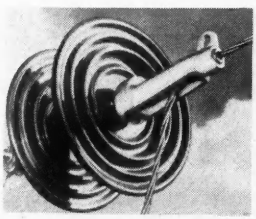
Washing Machines

Three new washing machines to be marketed by UNIVERSAL BOILERS & ENGINEERING CO., LTD., Fulledge Works, Burnley, under the name of "Swirlux," comprise a round machine with hand wringer, a round machine with power wringer, and a square de luxe model with power wringer. A new design of agitator is incorporated, the de luxe model having a new timing device and other special features.

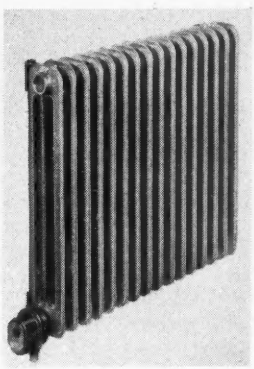
All three machines have a capacity of 11 lb dry weight of clothes, and incorporate a ½ h.p. motor, resiliently mounted. Most machines are supplied with a pump to facilitate emptying and vitreous enamelled table tops are available. Cream stove enamel is the standard finish, the steel pan being vitreous enamelled.

Polishing Motor

A new polishing motor introduced by HIGGS MOTORS, LTD., Witton, Birmingham, 6, is available in 2 and 5 b.h.p. sizes for operation on 50 or 60 c/s, two- or three-phase mains. Dust extraction equipment, guards, tool rests, etc., cannot be supplied, but the machine is offered as a pedestal or bench mounting unit complete with push-button starter.

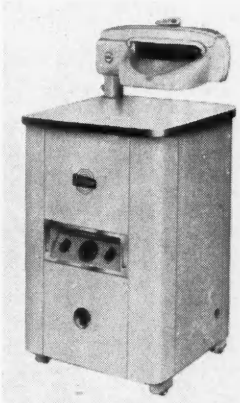


Overhead line terminating clamp (Cable Covers, Ltd.)



Hurseal radiator for marine or industrial use

"Swirlux" de luxe washer



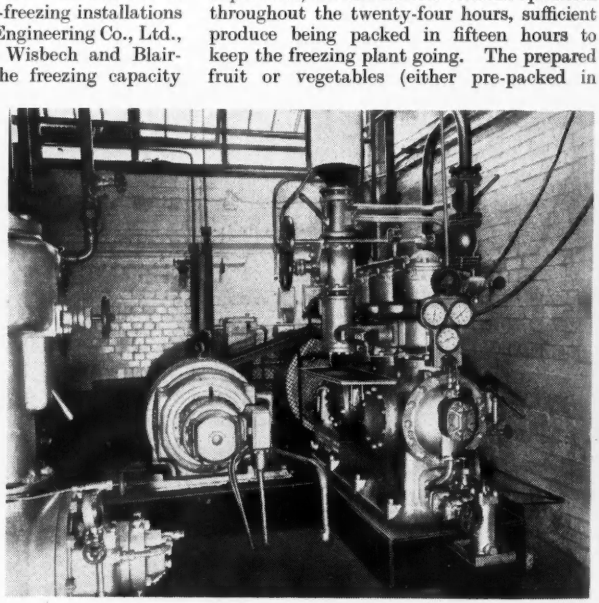
Loading a filled truck into the freezing tunnel. The duct admitting the cold air to the pre-cooling room is seen above the opened door

Quick-Freezing

New Installations at Wisbech and Blairgowrie

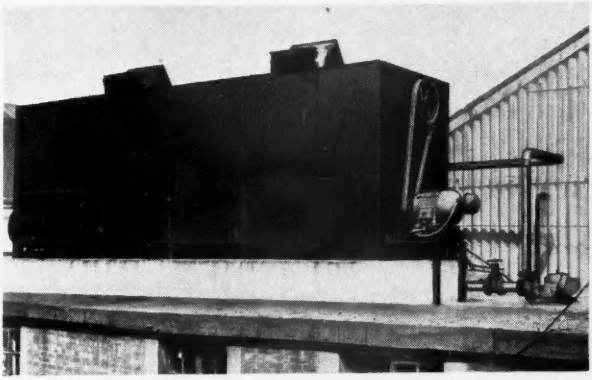
MAXIMUM output with the use of minimum floor area is achieved in two new quick-freezing installations carried out by the S.B. Engineering Co., Ltd., for Smedleys, Ltd., at Wisbech and Blairgowrie. At Wisbech the freezing capacity has been trebled by the removal of a single 80ft long freezing tunnel and the substitution of two modern 10 cwt an hour tunnels side by side, while simultaneously storage space has been substantially increased. The tunnels operate independently, a considerable advantage in view of the possibility of fluctuating supplies of produce.

During the freezing season (June–September) the tunnels are often in operation throughout the twenty-four hours, sufficient produce being packed in fifteen hours to keep the freezing plant going. The prepared fruit or vegetables (either pre-packed in



New 7in by 7in three cylinder compressor plant installed to serve the freezing tunnels at Wisbech

ca tons or spread on tr vs for packing after fr zing) are loaded on sp cially designed alu- m ium trolleys each h ding about 5 cwt. B fore entering the fr zing tunnels these tr lleys go to the pre- co ling room (which is of sufficient capacity to hold enough trucks for the night shift) where the temperature is maintained at 40 deg F by a small evaporator unit served by a York Shipley 5in by 5in ammonia compressor (with G.E.C. 20 h.p. motor and Allen West starter), the air being circulated by means of a 3 h.p. fan.



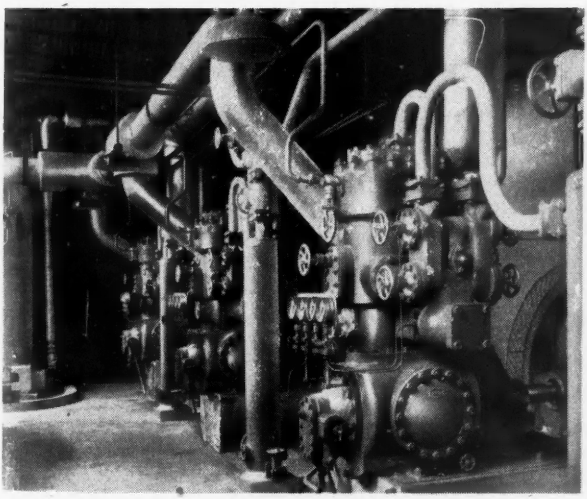
Evaporative condenser erected on the roof of the Wisbech factory

Each tunnel holds five trolleys which are admitted and removed through air-locks. The vestibule doors of the air-locks are self-closing and with the aid of conveyor gear the trolleys travel through the tunnel in from two to three hours according to the type of produce being quick-frozen.

The admission of a sixth trolley to the tunnel automatically ejects the first into the unloading air-lock and gives both aural and visual warnings. Electrical interlocks prevent the introduction of any further trolleys into the tunnel until the one in the unloading air-lock has been removed to the unloading area, the temperature of which is kept at around 40 deg F. From the unloading area the frozen produce is loaded into the adjoining cold stores where the temperature is maintained at −5 deg F by coils attached to the ceiling.

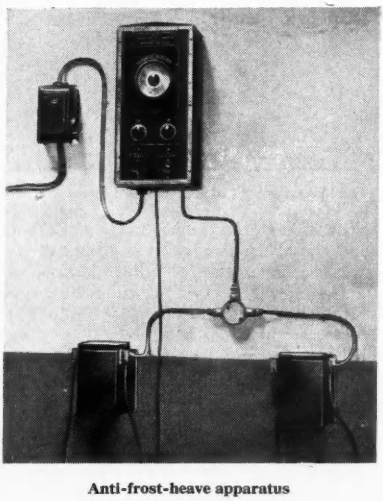
In the freezing tunnel itself gilled evaporator tubes mounted horizontally in batteries over and at the loading end of the tunnels are employed to keep the ultimate air temperature down to −30 deg F (evaporator temperature −40 deg F). Air in the tunnels is circulated, in a direction opposite to the travel of the trucks, by 48in axial flow fans driven by Brook 20 h.p. motors.

To supplement the two 11¼in by 8in and one 7½in by 7½in twin cylinder ammonia compressors (York Shipley with Brook 35 h.p. and 55 h.p. motors) already installed to serve the old single freezing tunnel, a new 7in by 7in three-cylinder compressor



Tandem twin cylinder compound compressors in the main engine room at Blairgowrie

(William Douglass & Son) driven by a 75 h.p. Crompton Parkinson motor has been installed. The three existing cold storage rooms are served by a 5in by 5in twin compressor (York Shipley) with a 20 h.p. Brook motor and a 4in by 4in twin compressor (J. & E. Hall) with a 10 h.p. Brook motor is installed for the new 10,000 cu ft cold room. To guard against the risk of breakdown of plant, all compressors are interconnected. An evaporative condenser has been erected on the roof of the building to serve all the compressors and is fitted with a Girdlestone pump (4 h.p. Brook motor). A smaller pump is provided to circulate water round the compressor cylinder jackets.

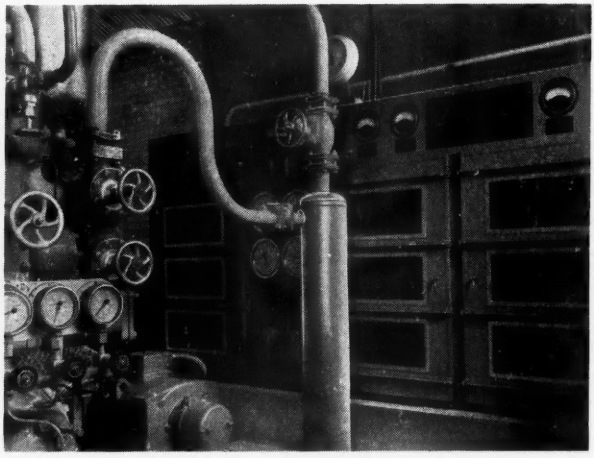


Anti-frost-heave apparatus

As a precaution against frost-heave and the consequent cracking of the floor, a grid of stainless steel rods has been laid under the cork insulation of the whole area of the freezing tunnel and cold stores. These grids are supplied through transformers at a maximum of 30 V and are thermostatically controlled to operate whenever the temperature below the foundations drops below 33 deg F. The loading on these grids varies between ½ W and 1 W per sq ft. The anti-frost-heave apparatus was made by Pulver & Co., Ltd., and was supplied through the Armstrong Cork Co., Ltd., which was responsible for the insulation work.

The installation at Blairgowrie is practically identical with that at Wisbech except inasmuch as the peculiarities of the building, a century-old flax mill, made modifications necessary. The freezing plant again comprises two 10 cwt an hour tunnels, but the storage capacity in this case is approximately 400 tons.

A noteworthy variation in the layout, however, is the grouping of the electrical control equipment for all the twenty or so motors (totalling 275 h.p.) on a 12ft by 7ft control panel (Dewhurst & Partner) installed in the plant room. This is fitted with glass inspection windows, the centre panel containing four 11in diameter ammonia gauges and a multi-point distant thermometer. For the freezing tunnels there are three 10in by 6in tandem twin cylinder compound compressors and two 5in by 5in sets serving the precooler and the cold stores; all the refrigeration equipment in this instance was supplied by G. & J. Weir, Ltd., the electric motors used being manufactured by the Harland Engineering Co., Ltd.



Group control has been adopted for the twenty or so motors in use at Blairgowrie

ELECTRICITY SUPPLY

London Price Increase

Recent Power Plant Contracts

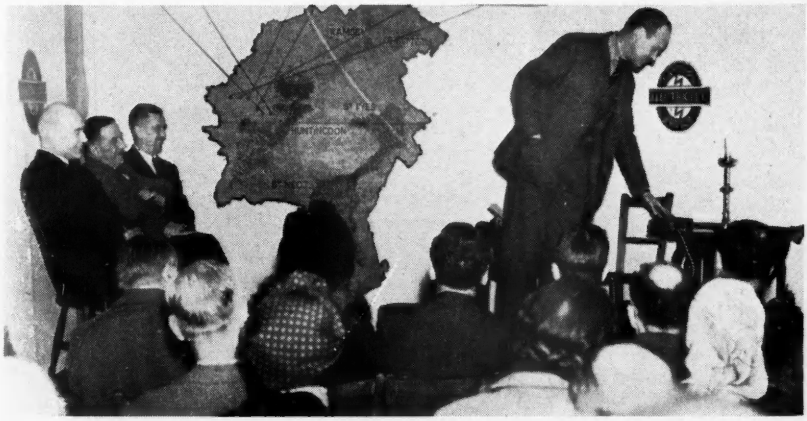
THE London Electricity Board announces that, following the meter readings after 20th April, there will be some increases in electricity tariffs in the London Area. The main increase will be from ¾d to ⅞d kWh in the running charge of two-part tariffs and in the lower kWh charge of block tariffs. A few minor changes will be made in other tariffs particulars of which will be advertised locally. The revisions become necessary because of increases in wages and the cost of coal, plant and other commodities and they constitute a further step towards the standardization of tariffs in London. In connection with the increases the L.E.B. has had discussions with the London Electricity Consultative Council.

B.E.A. *Contracts*

During the past month the British Electricity Authority has placed contracts amounting in the aggregate to £2,023,083. The principal contracts include:—Thornhill power station, nr. Dewsbury: No. 1 cooling tower (Davenport Engineering Co., Ltd.); Huddersfield station: No. 2 cooling tower (Davenport Engineering Co., Ltd.); East Yelland power station, nr. Barnstaple: Coal handling plant (Spencer (Melksham), Ltd.); Rye House station, Herts: Dust disposal plant (Wm. Press & Son, Ltd.); Huncoat station, Accrington: Workshop, garage, welfare and administration block (J. Gerrard & Sons, Ltd.); Tir John station, South Wales: Raw coal drying plant (British "Rema" Manufacturing Co., Ltd.); Connah's Quay station, Chester: 132 kV, 2,500 MVA switchgear (Ferguson, Pailin, Ltd.); Fleetwood station, Lancs.: 33 kV, 750 MVA switchgear (English Electric Co., Ltd.); Northampton station: 33 kV, 1,500 MVA switchgear (Ferguson, Pailin, Ltd.); Staythorpe substation, nr. Newark: 132 kV, 2,500 MVA switchgear (General Electric Co., Ltd.); Canterbury–Northfleet 132 kV line (W. T. Henley's Telegraph Works Co., Ltd.); Bonnybridge–Bathgate, S.E. Scotland 132 kV line (J. L. Eve Construction Co., Ltd.); and Portishead, Bristol 132 kV and multicore cable (British Insulated Callender's Cables, Ltd.).

Hunts Rural Supplies

Extinguishing a candle and pressing a switch to illuminate Spaldwick Victory Hall with electric light, Viscount Hinchingbrooke, M.P., recently inaugurated a 11 kV reinforcement



Viscount Hinchingbrooke performing the official switching-on ceremony at Spaldwick Victory Hall. On the platform are Mr. C. T. Melling (chairman, Eastern Electricity Board), Mr. Ferryman Brown (chairman, Spaldwick Parish Council) and Mr. G. B. Pierpoint (manager, Huntingdon District, Eastern Board)

line enabling a supply to be given to the villages of Ellington, Spaldwick, Easton, Leighton-Bromswold, Brington and Molesworth. He referred to the enterprise of the former Beds, Cambs & Hunts E.P. Co. and said it was feared that this spirit might disappear under State control. As time went on, however, they saw the same enterprising people still doing fine work in the new organization and began to feel that this English characteristic—the more things changed the more they remained the same—was working out.

Col. A. E. Knights, manager of the Fens Sub-Area, who introduced Viscount Hinchingbrooke, spoke of the Board's efforts not to spoil the rural amenities and pointed out that the lines had been put at the back of the houses to preserve the "old world" charm.

Mr. C. T. Melling, the Board's chairman, remarked that much had been said about the "Octopus of State." In actual fact, there were fourteen autonomous Boards, and they insisted on their autonomy, so in that respect they were semi-State.

The total cost of the project, including the 11 kV line and village distribution networks, was £34,000.

Wind Power

For some time experiments in connection with the use of wind for generating electricity have been carried out on Divis Mountain, one of a range that forms the western boundary to the hills which encircle Belfast to the north and west. Tests of wind velocities have been made, sponsored by the Ministry of Commerce, on various potential sites and a sum of money will be provided for further tests in the coming estimates. Divis Mountain, stated to be one of the most favourable sites in these islands, has an extreme altitude of 1,561ft.

Shin Scheme

The Shin Scheme (Constructional Scheme No. 32) announced by the North of Scotland Hydro-Electric Board on Tuesday will use the waters of Loch Shin and tributaries, the River Cassley, the River Brora and other streams in Sutherland for the annual production of about 167 million kWh. The scheme, which will harness the water power resources of an area of 250 square miles, is estimated to cost approximately £8,000,000. The work includes the construction of one main and five subsidiary power stations with a capacity of 44,000 kW. The main power station, on the north shore of the Kyle of Sutherland, will have a capacity of 25,000 kW. A five-mile tunnel will feed water to this station from Loch Shin which, by a dam 1,125ft long and 39ft high at Lairg, will be enlarged to provide a storage capacity of 10,300 million cu ft (equal to a reserve of 50 million kWh). Provision will be made for the ascent of salmon above this dam.

One of the subsidiary power stations will be built near West Shinness Lodge on a new bay formed by the enlargement of Loch Shin. It will draw water from the River Tirry and tributaries. The generating plant in the Tirry station will have a total capacity of 1,750 kW. Also on the north shore of Loch Shin is the Fiag station with a capacity of 1,000 kW. The Cassley station (3,750 kW) on the southern shore of Loch Shin will use water brought by tunnel from the upper Cassley and streams which feed it.

There are two subsidiary developments to the north-west of Loch Shin. One consists of a dam to enlarge Feur Loch, an aqueduct and a power station with a capacity of 1,000 kW. The remaining station, Ben Hee, is to be on the opposite side of Loch Merkland and will have a capacity of 5,000 kW.

Wick Diesel Plant

The North of Scotland Board published on the same day details of its new diesel generating station at Wick (Constructional Scheme No. 59) which will more than double the existing generating plant capacity in Caithness. This station will have a total installed capacity of 3,600 kW consisting of six 600 kW diesel sets. Its construction is estimated to cost £157,120.

Tramway Auction

Efforts to save the Portrush–Giant's Causeway tramway in Northern Ireland having failed, the cars, generators, turbines, rails, etc., are to be sold by public auction in Belfast on 15th March.

Consultative Council's Representations

WHEN the Eastern Electricity Board announced last year that it proposed to increase its charges the Consultative Council objected and subsequently made representations to the B.E.A. and later to the Minister of Fuel and Power. The appointment of a new Minister and the subsequent fuel crisis have delayed attention to this matter, but at last week's meeting of the Council the chairman (Alderman W. J. Bennett) reported that the Minister had assured him that he was most anxious to meet the Council and it was hoped to arrange this in the near future.

In the meantime the Council has been notified of the effects of the increase of 4s 2d a ton in the price of coal and also of the revision of the B.E.A.'s bulk supply tariff made necessary by rising capital charges on new plant, and other increased costs. Referring to these, the chairman commented that the whole tariff structure would have to be looked at, for although industrial consumers with coal clause tariffs paid the higher fuel charges they did not meet the increased capital costs.

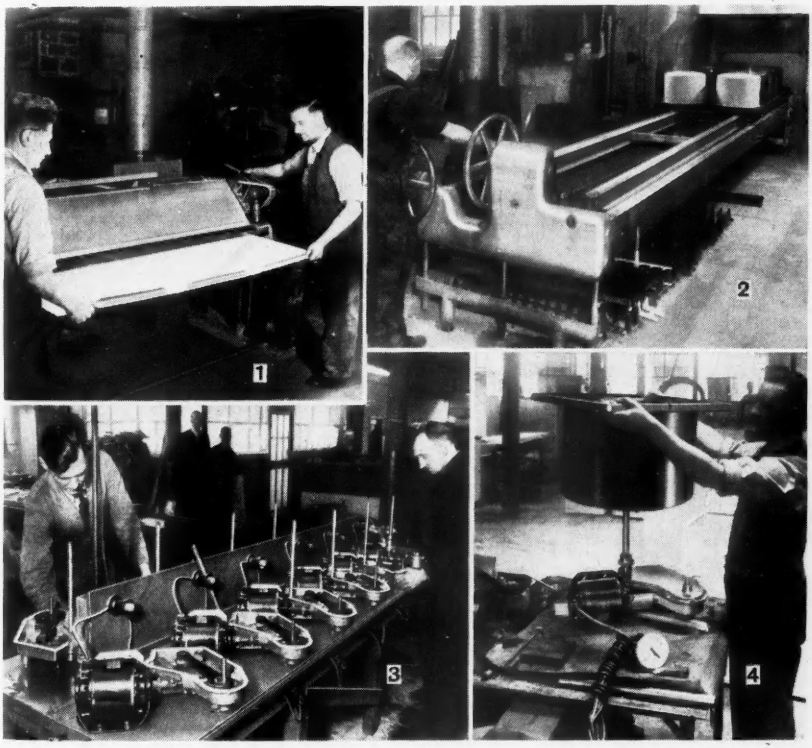
Home Appliances

Production at a New Factory at Oldham

OVER 250 people are employed in the manufacture of electric washing machines, drying cabinets and water heaters at a new factory which H. Fisher (Oldham), Ltd., have opened in Pennant Street, Oldham. The site will allow ultimately for a built-up area of over 100,000 sq ft, but initially there is about 45,000 sq ft of floor area available, while extensions already sanctioned will be built this year.

The planning of the factory is a result of experience gained over the last two years, since the company was taken over by the Lloyd's Engineering Companies, Ltd. The managing director, Mr. F. Lloyd-Kessel, whose main activities previously were in heavy engineering, has gradually extended the company's activities into the domestic field. New types of home laundry equipment have been introduced so that with four washing machines on the market the company claims to be the only British maker with such a comprehensive range.

In the new Fisher factory:—(1) A body begins to take shape. (2) The vitreous-enamelling plant. (3) Rigorous dry test of gears. (4) Tub and gear box assembly



The new factory is laid out for large scale production and produces almost every part of the various washing machines. Foundry work, however, is sub-contracted. In the basement a comprehensive vitreous-enamelling plant has been installed with provision for doubling output to meet the company's forthcoming development programme. The sheet metal and welding shops making all the necessary metal bodies for washers, dryers and heaters are on the same floor.

On the ground floor is the machine tool section, all machined parts undergoing a most rigid inspection control. In the gear box section the gears are fitted into the gear boxes, with various intermittent inspections during assembly, until the complete units go to special test benches for full tests of several hours. On the same floor are the water heater assembly the repair assembly and tool room sections.

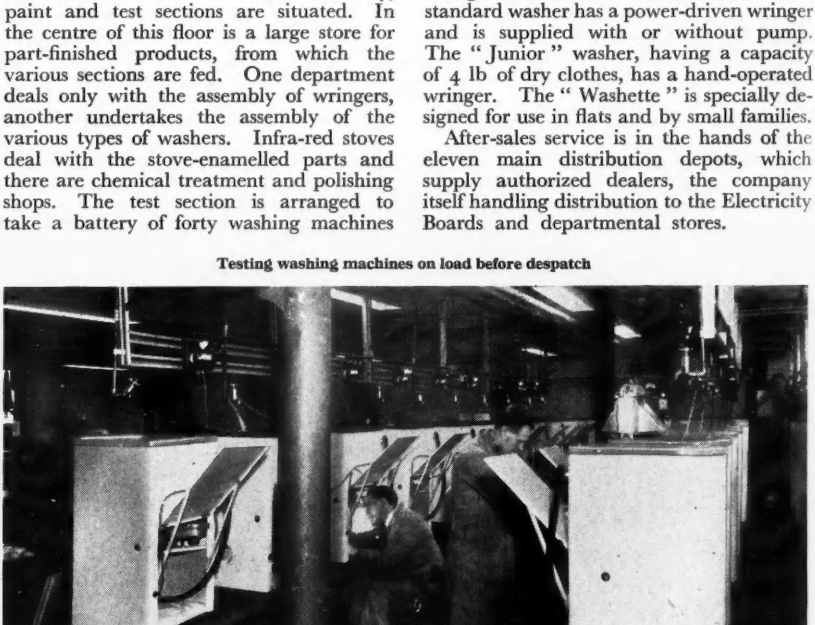
An easy flow is arranged from the previous two floors to the first floor where assembly, paint and test sections are situated. In the centre of this floor is a large store for part-finished products, from which the various sections are fed. One department deals only with the assembly of wringers, another undertakes the assembly of the various types of washers. Infra-red stoves deal with the stove-enamelled parts and there are chemical treatment and polishing shops. The test section is arranged to take a battery of forty washing machines at a time under load conditions, the normal change taking place every 3½ hours. An intricate test control, with various coloured pilot lights, indicates the results obtained.

To provide an additional or alternative source of electricity supply for the factory a power station, built by one of the company's associates, the Electroplant Co., Ltd., has been put into commission; it consists of five direct-coupled diesel alternating sets with a total output of 400 kVA.

The main activities are devoted at present to the manufacture of washing machines, the range of which includes the smallest and cheapest, the "Washette," built at the company's branch works in Wembley; the standard and de luxe washers now in full production at Oldham; and the latest model, the "Junior," intermediate between the "Washette" and the standard, available shortly. All the washers have agitators, and the de luxe machine has its own electric heating, pump, power-driven wringer and master switch control. The standard washer has a power-driven wringer and is supplied with or without pump. The "Junior" washer, having a capacity of 4 lb of dry clothes, has a hand-operated wringer. The "Washette" is specially designed for use in flats and by small families.

After-sales service is in the hands of the eleven main distribution depots, which supply authorized dealers, the company itself handling distribution to the Electricity Boards and departmental stores.

Testing washing machines on load before despatch



FINANCIAL SECTION

Company Notes and Stock Exchange Activities

Reports and Dividends

Associated Electrical Industries, Ltd., reports a consolidated trading profit for the year ended 31st December last of £8,440,000, as compared with £7,602,000 for 1949, to which is added £144,000 dividends and interest on trade investments, and £21,000 profit on sale of investments and miscellaneous assets, making £8,605,000. After providing £810,000 for depreciation, £3,960,000 for taxation, and meeting other charges, there is a balance of £3,446,000. Against this is charged £950,000 for increased replacement cost of fixed assets, and after allowing £4,000 proportion of profits of subsidiary companies attributable to minority shareholdings, and £335,000 balance carried forward or added to reserves in subsidiaries, the balance that is available for appropriation by A.E.I., Ltd., is £2,157,000 (against £2,273,000). It is proposed to raise the final ordinary dividend to 15 per cent, making 20 per cent for the year (against 15 per cent).

The following proposals, together with the necessary resolutions, will be submitted to stockholders at an extraordinary meeting, and at separate meetings of the preference and ordinary stockholders, to be convened as soon as possible. The necessary permission for the issue of shares has been received from the Capital Issues Committee. These proposals are :—1 (a) To reduce the cumulative rate of dividend on the £2,669,240 preference stock from 8 to 4½ per cent. (b) In return, the preference stockholders to be offered the right to subscribe for 800,772 ordinary shares at £1, that is in the ratio of three ordinary shares for £10 of preference stock held. (c) To issue at 20s, 330,760 new 4½ per cent cumulative preference shares which will be offered to the present preference stockholders only. 2. To issue to employees of the group, who number over 55,000, 699,228 ordinary shares at the price of 40s per share. The object of this issue is to offer the employees a proprietary interest in the company. Large applications for shares will be scaled down so as to allow small applicants as far as possible to obtain allotment in full. Employees who subscribe for these shares will be obliged to enter into a covenant not to re-sell them within a period of two years. The directors of A.E.I. will not participate in this issue. If these resolutions are passed by the stockholders, the capital of the company will be £3,000,000 4½ per cent cumulative preference stock and £7,500,000 ordinary stock.

Lancashire Dynamo Holdings, Ltd., report a net group profit, before taxation, of £401,692 for 1950, as compared with £317,011 for 1949. After deducting taxation (£224,287) and adding £37,350 tax provision no longer required, there is a balance available of £214,755. It is proposed to pay a final ordinary dividend of 10 per cent, plus a bonus of 7½ per cent, on enlarged capital, making 22½ per cent for the year (unchanged).

The Westinghouse Brake & Signal Co., Ltd., reports a group trading profit for the year ended 30th September last of £478,653, as compared with £489,110 for 1948-49. After making various provisions, the amount attributable to shareholders in the holding company is £224,634 (against £214,480). Of this, £56,665 is retained by subsidiaries, leaving the net profit of the parent company £167,969 (against £171,932), plus previous income and provisions no longer required £16,915, making £184,884. Plant and equipment reserve receives £20,000, reserve for contingencies £40,000, and tax reserve £40,000. The dividend for the year is maintained at 14 per cent and £98,112 is carried forward (against £99,651 brought in).

International Combustion (Holdings), Ltd., shows a group profit for the year ended 30th September last, after providing for all charges, including taxation, of £376,264, as compared with £244,206 for the previous year. United Kingdom taxation absorbed £531,348 (against £345,073). It is proposed to pay a final dividend of 15 per cent, making 20 per cent for the year. For 1948-49 an interim dividend of 10 per cent was paid on £351,698 and a final of 11 per cent on capital increased by the 150 per cent share bonus.

The Midland Electric Manufacturing Co., Ltd., reports a net profit for 1950, after deducting £162,485 for taxation, of £129,616, as compared with £117,891 for 1949. It is proposed to pay an ordinary dividend of 15 per cent for the year (against 12½ per cent).

J. & E. Hall, Ltd., report a trading profit for 1950 of £631,274, as compared with £559,028 for the preceding year, and a net

profit of £165,054 (against £113,831). It is proposed to pay an ordinary dividend for the year of 12½ per cent (against 10 per cent), to place £238,100 to general reserve, and to carry forward £161,687 (against £284,893 brought in).

A. F. Bulgin & Co., Ltd., report a profit for 1950 of £66,326, as compared with £49,061 for 1949, and after deducting taxation of £43,200, there is a net balance of £23,126. It is proposed to pay a dividend for the year of 27½ per cent (against 25 per cent), and to carry forward £18,543 (against £10,542 brought in).

Bruce Peebles & Co., Ltd., report a profit for 1950, after deducting £120,000 for taxation, of £112,879, as compared with £115,229 for 1949. It is proposed to pay an ordinary dividend for the year of 12½ per cent (against 10 per cent).

Desoutter Brothers (Holdings), Ltd.—An offer for sale was made on Monday last of 350,000 5½ per cent cumulative preference shares of £1 each at 21s per share and 350,000 ordinary shares of 5s each at 10s 6d per share in Desoutter Brothers (Holdings), Ltd., which is acquiring all the issued capital of Desoutter Brothers, Ltd., manufacturers of pneumatic and electrical portable power tools and standardized press tool sets.

Pye (Ireland), Ltd., was to hold an extraordinary meeting on 6th March to increase the authorized capital to £300,000 by the creation of 100,000 5 per cent £1 cumulative preference shares.

E. K. Cole, Ltd., have declared an interim ordinary dividend of 10 per cent (against 8 per cent).

Crabtree Electrical Industries, Ltd., are again paying an interim dividend of 5 per cent.

Morphy-Richards, Ltd., have announced an unchanged interim dividend of 15 per cent.

Increase of Capital

Pye, Ltd.—Increased by £1,150,000, in 1,600,000 deferred ordinary shares of 5s each and 750,000 preference shares of £1 each, beyond the registered capital of £500,000.

New Companies

Walter Robinson (Electrical), Ltd.—Registered 26th February. Capital £10,000. To acquire the businesses (1) of an electrical, radio, television and refrigerating engineer and dealer carried on by Walter Robinson at 40, Bradford Road and at Rayner Road, Brighouse; and (2) a similar business and that of a dealer in bicycles and accessories carried on at 8, Whitehall Road, Hipperholme, Brighouse. Directors: W. Robinson, Mrs. Eveline Robinson and Mrs. Sarah J. Robinson. Regd. office: 40, Bradford Road, Brighouse, Yorks.

Beswick (Exmouth), Ltd.—Registered 26th February. Capital £5,000. Manufacturers and repairers of electric fuses and dealers in electrical components and accessories, etc. Directors: K. E. Beswick and W. F. Melbourn. Regd. office: 46, Church Avenue, Beckenham, Kent.

Cooper & Company (Shrewsbury), Ltd.—Registered 22nd February. Capital £1,000. Electrical engineers and contractors, etc. Directors: G. A. Cooper and Mrs. Irene Cooper. Regd. office: 15, Ellesmere Road, Shrewsbury, Salop.

Meeting of Creditors

Green Electrical & Engineering Co., Ltd.—Meeting of creditors on 14th March at 35, Burley Street, Leeds.

Liquidations

Leigh Electric Co., Ltd.—Particulars of claims by 19th March to the liquidator, Mr. O. G. Harvey, 70, Victoria Road North, Southsea, Hants.

L. Bunce (Electrical), Ltd.—Meetings of members and creditors on 3rd April at 196, Wolverhampton Street, Dudley, to receive an account of the winding-up by the liquidator, Mr. D. Tanfield.

Premier Electric Services, Ltd.—Winding up voluntarily. Liquidator: Mr. R. A. Haigh, Court Chambers, Friar Lane, Leicester. Particulars of claims to the liquidator by 14th April.

Bankruptcies

G. H. Payton, residing at 23, Albion Street, Birmingham, and lately residing at 373, Soho Road, Handsworth, Birmingham, and carrying on business as 157-159 King Edward Road, Ladywood, Birmingham, electrical contractor.—Trustee, Mr. W. Le'R. Hand, Fletchers Chambers, Fore Street, Birmingham, 2, released 14th February.

J. V. Depledge, 68, Vivian Avenue, Scunthorpe, Lincs, lately carrying on business at 108, Frodingham Road, Scunthorpe, electrical contractor.—Last day for receiving proofs for dividend 14th March. Trustee, Mr. L. F. McCulloch, 26, South Saint Mary's Gate, Grimsby, Lincs.

P. Thomas, 43, New Street, Ledbury, Hereford, lately carrying on business at 4, New Street, Ledbury, radio and electrical engineer.—First meeting on 12th March at the Shire Hall, Hereford. Public examination, 30th April at the Shire Hall, Hereford.

STOCKS and SHARES

STOCK Exchange markets are attracting a considerable volume of business, which may seem surprising in view of the fact that a Budget, coming in the near future, is certain to impose fresh burdens upon most classes of the community. Conjecture toys with the idea that there will be fresh taxation of profits, distributed and undistributed, but all such prophecies are purely guesswork, and Stock Exchange markets, as the amount of business testifies, pay little heed to the prospects.

Week's Prices

Prices on the whole keep very firm, with the exception of those in the gilt-edged market. Even in the latter there has been, within the past few days, a mild recovery from the lowest quotations recently reached. In the electrical equipment and manufacturing groups, there are about twenty-five rises on the week, ranging from 6d to 2s 6d. Cable & Wireless ordinary at 115½ has added 3 to its price of a week ago. Rises have occurred in General Electric, 87s 6d, Ward & Goldstone, 39s 3d, Westinghouse Brake, 62s 6d, Midland Electric, 58s 6d, Ericsson, 47s 9d, Brush, 7s 6d, Ever Ready, 31s, and a number of others.

A.E.I. Results

Associated Electrical Industries fell about 5s, then recovered to 87s 6d, after news of the increase in the final dividend from 10 to 15 per cent (making 20 per cent for the year) and the accompanying statement. It is clear that previous expectations had reached extravagant proportions, for although there was a rise of over £800,000 in the group trading profit, the restraint with which the net surplus is being distributed is in strict keeping with present times and considerations. Allowing for the dividend in the price, the shares at 88s show a yield of £4 12s 3d per cent on a still highly conservative distribution. Market reactions were influenced by the scheme for reorganizing the preference capital and by the proposal to issue nearly 700,000 ordinary shares at 40s to the group's 55,000 employees.

Preference Scheme

A.E.I.'s proposals for the preference stock include the reduction of the dividend rate from 8 to 4½ per cent; the right, by way of compensation, to subscribe for ordinary shares at £1 in the ratio of three ordinary for each £10 preference stock held; and an offer of new 4½ per cent preference shares at par. That the proposition is regarded, from the preference stockholder's standpoint, as a decidedly attractive one is witnessed by the rise in the price of the present 8 per cent shares from 34s 6d to 40s. So far as ordinary stockholders are concerned, market opinion is that they evidently have to balance immediate concessions against the long-term advantages of both the preference and the employees' participation schemes.

Hoover Results

The market proved a little hard to please in the matter of Hoover's statement last week, for the price of the 5s shares came down a few pence to 28s 3d, following upon news of the increase in both profits and final dividend. The latter, of 22½ per cent, applies to capital doubled by the recent capital bonus. Allowing for this, it compares with last year's equivalent of 17½ per cent, and makes, with the last interim dividend, a total equal to 30 per cent on the present capital. Group profits (before tax) expanded by 44 per cent. This follows the doubling of the net profit in 1949 and means that the figure has been multiplied nearly four times in that number of years. By comparison, the dividend increases look severely restrained. The latest rate gives a yield of 5¼ per cent at the present price of the shares.

Ekco Interim

E. K. Cole 5s ordinary shares reacted to 21s 9d after a rise to 22s 6d on the announcement of a 10 per cent interim dividend in respect of the year ending this month. It compares with last year's 8 per cent payment, which was followed by a final of 12 per cent, declared in July. The latest news added about 1s 9d to recent appreciation in the price of the shares which, at 21s 9d, are worth more than they have been for three years or more. E.M.I. are noticeably firm at 20s 9d, Pye have hardened to 21s 9d (the new 5 per cent preference shares being about 1s below that figure) and interest is well sustained in Cossor ordinary, now 12s 3d, and the 6 per cent preference, at 22s.

Miscellaneous Matters

Market expectations were more than satisfied with the big advance in profits reported by International Combustion and with the final dividend, making 20 per cent for the year. This would compare with last year's equivalent of 15 per cent, making allowance for the capital bonus. Having risen 1s to 19s 6d, the 5s shares give over 5 per cent at the new rate. Lancashire Dynamo's profits also made a good impression. Dividends, payable this time on larger capital, again total 22½ per cent, and with the price of the £1 shares at 101s, reflecting some mild disappointment at the absence of an increase, the yield is approximately 4½ per cent. Following the increase in the Midland Electric Manufacturing ordinary dividend, from 12½ to 15 per cent, the £1 shares rose to 60s and now show a return of 5 per cent.

NEXT WEEK'S EVENTS

Monday, 12th March

BIRMINGHAM.—Imperial Hotel, Temple Street, 6 p.m. I.E.E. South Midland Supply & Utilization Group.• "Evolution of the Lighting Art," by Dr. J. W. T. Walsh.

BRISTOL.—Electricity House, Colston Avenue, 6 p.m. I.E.E. Western Centre. "Some Experience with a British A.C. Network Analyser," by G. Lyon.

LONDON.—Savoy Place, W.C.2. 5.30 p.m. I.E.E. Informal meeting. Discussion on "Electronic Power Control of Motors," opened by E. W. Forster.

Café Royal, Regent Street, W.1, 6 for 6.30 p.m. Batti-Wallahs' Society. Ladies' Night. Dinner, dance and cabaret.

NEWCASTLE-ON-TYNE.—Neville Hall, Westgate Road, 6.15 p.m. I.E.E. North-Eastern Centre. "Standardization and Simplification in the Electrical Industry," by J. T. Moore. "An Organization for Internal Standardization in a Large Manufacturing Company," by P. J. Daglish.

RUGBY.—E.M.E.B. Showrooms, High Street, 6.30 p.m. I.E.E. Rugby Sub-Centre. "The Design and Performance of Surge Diverters for the Protection of Alternating-Current Systems," by T. F. Monahan. "Design of Power Transformers to withstand Surges due to Lightning, with special reference to a New Type of Winding," by A. T. Chadwick, J. M. Ferguson, D. H. Ryder and G. F. Stearn.

STONE.—Crown Hotel, 7 p.m. I.E.E. North Staffordshire Sub-Centre. "Railway Electrification in Great Britain," by C. M. Cock.

Tuesday, 13th March

BELFAST.—Queen's University, 6.45 p.m. I.E.E. Northern Ireland Centre. "The Development and Design of Electrical Control Gear for Machine Tools," by A. R. H. Thorne.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Measurements Section. "The Testing of Fine Wires for Telecommunication Apparatus," by R. C. Woods and J. K. Martin. "The Use of an Electrostatic Wattmeter for Magnetic-Loss Measurements," by J. K. Choudhury and A. Glynne. (Joint meeting with the Radio Section.)

66, Portland Place, W.1, 6 p.m. Illuminating Engineering Society. "The Lighting of Buildings," by W. A. Allen and Dr. R. G. Hopkinson. (Joint meeting with the Royal Institute of British Architects.)

MANCHESTER.—Engineers' Club, Albert Square, 6.15 p.m. I.E.E. North-Western Centre. Report on "The Education and Training of Electrical Technicians." Prepared by the Joint Committee on Practical Training in the Electrical Industry. To be presented by J. W. Thomas.

WIMBLEDON.—St. George's Hall, St. George's Road, 8.15 p.m. A.S.E.E. South West London Branch. "Corrosion," by G. E. D. Redman.

Wednesday, 14th March

BIRMINGHAM.—James Watt Memorial Institute. I.E.E. South Midland Students' Section. "Lighthouses, Ancient and Modern," by H. Gough. (Annual joint meeting with the Institutions of Civil and Mechanical Engineers.)

Chamber of Commerce, New Street, 7 p.m. A.S.E.E. Birmingham Branch. "A.C. Commutator Machines."

Central Technical College, Suffolk Street, 7 p.m. Junior Institution of Engineers, Midland Section. Lecture on the latest developments in television, by J. C. Gilbert and W. F. Poole.

BRADFORD.—Midland Hotel, 7.30 p.m. A.S.E.E. Bradford Branch. "The Application of Refrigeration," by E. Hargreaves.

CANTERBURY.—County Hotel, 8 p.m. A.S.E.E. Kent Branch. "The Testing of the Earth and its Resistivity," by H. Coulls.

EDINBURGH.—Heriot-Watt College, 7 p.m. I.E.E. Scottish Centre. "Recent Developments in Comparative Methods of Testing A.C. Electricity Meters," by S. F. Musson and R. E. Mell.

I.E.S. Edinburgh Centre. Annual general meeting. Presidential address by L. J. Davies, followed by annual dinner.

LONDON.—Savoy Place, W.C.2, 7 p.m. I.E.E. London Students' Section. Problems Night.

At the Institution of Mechanical Engineers, Storey's Gate, S.W.1, 6 p.m. Institution of Heating & Ventilating Engineers. "Heating Research in Occupied Houses," by Dr. J. C. Weston.

OXFORD.—Electricity Showrooms, S.E.B., 37, George Street, 7 p.m. I.E.E. District meeting. "The Use of the Synchroton and other Particle Accelerators in Atomic Research," by C. H. Collie.

Thursday, 15th March

CARDIFF.—Park Place, 6 p.m. South Wales Institute of Engineers. Annual general meeting. "Automatic Electric Winding," by O. T. Evans and P. H. Harvey.

CHELTENHAM.—Cadena Café, High Street, 6.30 p.m. I.E.S. Gloucester and Cheltenham Centre. "Hospital Lighting," by D. J. Reed.

DUBLIN.—Trinity College, 6 p.m. I.E.E. Irish Branch. "Electricity Supply in the U.S.A.," by W. R. Roe and R. L. S. McDowell.

GLASGOW.—I.E.S. Glasgow Centre. Annual general meeting. Presidential address by L. J. Davies, followed by annual dinner.

LEEDS.—Lighting Service Bureau, 24, Aire Street, 6 p.m. I.E.E. North Midland Centre Education Discussion Circle. "The Organization of Laboratory Work," by Dr. E. C. Walton.

LONDON.—Savoy Place, W.C.2, 5.30 p.m. I.E.E. Utilization Section. "Transients in Electric Mine Winders and their Effects on Rope Stresses," by T. H. Petch.

Savoy Hotel, W.C., 6.30 for 7 p.m. Electrical Wholesalers' Federation. Annual dinner.

Caxton Hall, S.W.1, 2.30 p.m. Diesel Engine Users' Association. "Operating Experience with a 750 kW Industrial Gas Turbine," by G. B. R. Feilden.

NORTHAMPTON.—College of Technology, 7 p.m. E.P.E.A. Midland Technical Group. "Modern Street Lighting," by P. Hartill.

(*Continued at foot of page* 517)

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (2s each) may be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1942

3289. Murphy Radio, Ltd., Davies, K. S., and Hawkins, G. F.—Carrier wave communication. 25th August, 1947. (652221.)

1945

2156. British Thomson-Houston Co., Ltd.—Ultra-high-frequency oscillation generators. 26th January, 1945. (652031.)

16934. British Thomson-Houston Co., Ltd.—Electric discharge devices. 3rd July, 1945. (652225.)

1946

7473. Philips Lamps, Ltd.—Apparatus for the reproduction of picture and/or sound films. 11th March, 1946. (652228.)

17083. Compagnie Générale d'Electricité.—Control devices for the setting of selectors. 5th June, 1946. (652231.)

17178. Teletype Corporation.—Telegraph systems. 6th June, 1946. (652152.)

20014. Philips Lamps, Ltd.—Sources of radiation containing luminescent substances. 4th July, 1946. (652091.)

24929. France, H. G. De.—Devices for the correction of defects in television images. 21st August, 1946. (652153.)

25958. Igranic Electric Co., Ltd.—Frequency meters. 29th August, 1946. (652233.)

28157. Radio Corporation of America.—Telegraph translating circuits. 19th September, 1946. (652154.)

35340. Western Electric Co., Inc.—High-frequency electric discharge device. 28th November, 1946. (652155.)

1947

6131. Igranic Electric Co., Ltd.—Controllers for slip ring alternating current motors. 4th March, 1947. (652156.)

6190. Radio Corporation of America.—Circuit arrangements for use on ultra-high frequencies. 4th March, 1947. (652240.)

7155. Western Electric Co., Inc.—Light-sensitive electrical devices and methods of making them. 14th March, 1947. (652241.)

17685. Teletype Corporation.—Telegraph systems. 4th July, 1947. (652157.)

19661. Philco Corporation.—Method and apparatus for removing burns from cathode-ray tubes. 22nd July, 1947. (652096.)

20660. British Thomson-Houston Co., Ltd.—Electric switches for the interconnection of polyphase apparatus. 30th July, 1947. (652036.)

21424. Radio Corporation of America.—Trigger pair circuits using thermionic valves. 6th August, 1947. (652160.)

21442. Akt.-Ges. Brown, Boveri, & Cie.—Magnetic induction accelerator. 6th August, 1947. (652247.)

27518. General Electric Co., Ltd., Hayes, A. G., and Moore, R. C.—Methods of providing electrically-conducting paths through glass walls. 13th October, 1948. (652255.)

29705. Electronic Tubes, Ltd., and Swift, J. D.—Gas discharge tubes. 18th October, 1948. (652100.)

30306. Radio-Industrie Soc. Anon.—Signalling devices for television camera control. 14th November, 1947. (652037.)

31562. Philips Electrical, Ltd.—Electric discharge tubes and methods of manufacturing such tubes. 28th November, 1947. (652101.)

33289. Standard Telephones & Cables, Ltd.—Electrical signalling systems with a constant number of signal elements and two alternating current frequencies. 17th December, 1947. (652262.)

33459. Philips Electrical, Ltd.—Method of providing gas-binding layers in electric discharge tubes. 18th December, 1947. (652102.)

33824. Vigren, S. D., Claesson, P. H. E., and Freese, H.—Automatic telephone systems. 22nd December, 1947. (652263.)

34195. Akt.-Ges. Brown, Boveri, & Cie.—Sparkless interruption of polyphase circuits. 24th December, 1947. (652164.)

34751. General Electric Co., Ltd., and Allard, L. S.—Cathode-ray tubes and like devices. 15th December, 1948. (652267.)

35432. Moriondo, E.—Dynamometers. 31st December, 1947. (652104.)

1948

1707. Standard-Thomson Corporation.—Filling material for thermostatic devices. 20th January, 1948. (652282.)

2380. Faudell, C. L.—Circuit arrangements for production of steady voltages from voltage pulses. 27th January, 1949. (652045.)

2586. British Thomson-Houston Co., Ltd.—Luminescent materials. 28th January, 1948. (652106.)

2710. Sadir-Carpentier.—Modulating systems for ultra short waves. 29th January, 1948. (652168.)

2793. Robinson, E. H.—Circuits for producing a saw-tooth current in an inductance. 2.0th January, 1949. (652107.)

Next Week's Events (*Contd. from p. 516*)

Friday, 16th March

EDINBURGH.—North British Station Hotel. I.E.E. Scottish Centre. Annual dinner and visit of the President.

MANCHESTER.—Engineers' Club, Albert Square, 6.45 p.m. Manchester Association of Engineers. Annual general meeting. "Design in Relation to Manufacture," by C. A. Sparkes.

Saturday, 17th March

LEEDS.—Y.E.B. Offices, Whitehall Road, 2.30 p.m. I.E.E. North Midland Students' Section. "Research in Electrical Engineering," by K. J. R. Wilkinson.

MAIDSTONE.—Royal Star Hotel, 6 for 6.30 p.m. E.P.E.A. Kent Section. Annual dinner and dance.

OXFORD.—S.E.B. Demonstration Room, George Street, 2.30 p.m. A.S.E.E. Oxford Branch. "Ventilating."

4154. Ges. zur Forderung der Forschung an der Eidg. Techn. Hochschule.—Sound recording apparatus for motion picture films. 12th February, 1948. (652047.)

5101. British Thomson-Houston, Co., Ltd.—Protective arrangements for electric blankets and like articles. 20th February, 1948. (652108.)

5102. British Thomson-Houston Co., Ltd.—Filter systems for clothes washing machines. 20th February, 1948. (652169.)

5331. Winkel, H. C.—Battery grid castings. 23rd February, 1948. (652288.)

5333. British Thomson-Houston Co., Ltd.—Clothes washing machines. 23rd February, 1948. (652170.)

5464. Federal Machine & Welder Co.—Method and apparatus for electric welding pipe. 24th February, 1948. (652289.)

5479. Metropolitan-Vickers Electrical Co., Ltd.—Electrical protective systems. 24th February, 1948. (652291.)

5935. Director of the Office of Technical Services, Department of Commerce.—Electric pulse shortening circuit. 27th February, 1948. (652297.)

5946. Director of the Office of Technical Services, Department of Commerce.—Electro-magnetic waveguides. 27th February, 1948. (652171.)

6130. Radio Corporation of America.—Radio relay apparatus. 27th February, 1948. (652111.)

6278. Richardson, R. D.—Electric bridge measuring instruments. 28th February, 1948. (652299.)

7877. British Thomson-Houston Co., Ltd.—Temperature control systems. 16th March, 1948. (652052.)

8400. Naamlooze Vennootschap Philips' Gloeilampenfabrieken.—Electric discharge tubes with liquid electrodes. 22nd March, 1948. (652174.)

8823. Philips Electrical, Ltd.—Superheterodyne receiving circuits. 25th March, 1948. (652306.)

9462. Creed & Co., Ltd., and Kirchel, A. A.—Keyboard controlled telegraph apparatus. 1st April, 1949. (652113.)

9829. Elbourn, R. W.—Electrical integrating circuits and electrical counting circuits employing integrating circuits. 31st March, 1949. (652175.)

9981. Etablissements E. Jaeger.—Switches for controlling turning signals on motor vehicles. 9th April, 1948. (652055.)

10556. James, I. J. P.—Cathode-ray tube apparatus. 14th April, 1949. (652114.)

14479. Antiference, Ltd., and Best, N. M.—Short-wave aerials. 24th March, 1949. (652318.)

14961. Johnson, C. A.—Generation of picture signals for television transmission. 20th May, 1949. (652059.)

14962. White, K. D.—Apparatus for generating picture signals suitable for television transmission for kinematograph film. 3rd June, 1949. (652060.)

15187. British Thomson-Houston Co., Ltd., and Griffiths, L.—Speed indicating instruments. 31st May, 1949. (652121.)

16224. Radio Corporation of America.—Phase control apparatus especially for television synchronization. 16th June, 1948. (652122.)

17012. Bauly, H. G. (Zenith Radio Corporation.)—Electro-mechanical wave filters. 24th June, 1948. (652322.)

17335. British Thomson-Houston Co., Ltd.—Electrical detectors of vapours and the like. 28th June, 1948. (652061.)

17402. Simplex Electric Co., Ltd., and Osborn, F. W.—Combined electric switch-and-socket units. 29th June, 1949. (652062.)

17881. Belling & Lee, Ltd., and Strafford, F. R. W.—Aerials. 11th March, 1949. (652184.)

18502. Sperry Corporation.—Radio navigation systems for steerable craft. 9th July, 1948. (652325.)

19096. Simplex Electric Co., Ltd., and Osborn, F. W.—Combined electric switch-and-socket units. 13th July, 1949. (652065.)

19103. Faudell, C. L.—Apparatus for effecting operations under the control of electrical pulses. 5th July, 1949. (652066.)

19279. Bader, K. E.—Electric heaters for type-setting and composing machines and the like. 19th July, 1949. (652067.)

19322. Denton-Ingham, H. W. (Lumalampan Aktiebolag).—Lamp bases more particularly for electric fluorescent tubular lamps. 19th July, 1948. (652327.)

20738. British Telecommunications Research, Ltd., and Beaufoy, R.—Apparatus for generating electric oscillations. 25th July, 1949. (652126.)

21062. Lucas, Ltd., J., and Kendall, M. W.—Alternating current generators. 2nd August, 1949. (652187.)

21577. General Electric Co., Ltd., and Field, R. W. G.—Electric systems of remote control and/or supervision. 23rd June, 1949. (652127.)

22441. Marconi Instruments, Ltd., D. Napier & Son, Ltd., Willis, D. R., and Harrison, L. W.—Speed measuring recording instruments. 29th June, 1949. (652073.)

23408. British Thomson-Houston Co., Ltd.—Electric heating appliances. 6th September, 1948. (652330.)

23409/10. British Thomson-Houston Co., Ltd.—Electrical detection of vapours and the like. 6th September, 1948. (652132/33.)

23758. British Celanese, Ltd.—Control systems for electric motors. 9th September, 1948. (652188.)

24027. S. Smith & Sons (England), Ltd., and Meredith, P. W.—Electro-magnetically actuated clutches. 6th September, 1949. (652134.)

24618. Titterton, E. W.—X-ray systems. 20th September, 1948. (652074.)

26281. Westinghouse Electric International Co.—Protective systems for polyphase transmission lines. 8th October, 1948. (652191.)

27036. Patelhold Patentverwertungs- & Elektro-Holding Akt.-Ges.—Arrangement for distortionless pulse phase modulation. 18th October, 1948. (652333.)

27528. Westinghouse Electric International Co.—Carrier current protective relaying systems. 22nd October, 1948. (652193.)

28321. Cooke, Troughton, & Simms, Ltd., Taylor, E. W., and Payne, B. O.—Phase contrast microscopy. 31st October, 1949. (652195.)

28648. Electrolux, Ltd.—Centrifugal fans. 4th November, 1948. (652337.)

29333. Ferranti, Ltd., and Williamson, D. T. N.—Sound recording and reproducing apparatus. 30th November, 1949. (652340.)

29878. A. Herbert, Ltd., and Lloyd, A. H.—Control arrangements for electric motor-driven machine tool spindles. 18th June, 1949. (652196.)

30634. Bendix Aviation Corporation.—Telemetric system. 25th November, 1948. (652343.)

32966. Kranendonk, T.—Electric lanterns for vehicles. 21st December, 1948. (652089.)

33251. English Electric Co., Ltd., and Sim, N. S.—Alternating current dynamo-electric machines. 23rd December, 1949. (652200.)

1949

11463. Standard Telephones & Cables, Ltd.—Volume control for pulse code modulation-communication systems. 29th April, 1949. (652212.)

28840. Burnett, D. F., and Ryder, H.—Electroscopes. 10th November, 1949. (652213.)

1950

2191. Western Electric Co., Inc.—High-frequency electric discharge device. 28th November, 1946. (652219.)

17942. General Electric Co., Ltd., and Levy, M. M.—Circuits for electric pulses. 15th August, 1947. (Divided out of 652353.) (652410.)

Amended Specification

604907. Purves Corporation.—Apparatus sensitive to magnetic fields.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

CONTRACTS OPEN

Where "Contracts Open" are advertised in our "Official Notices" section, the date of the issue is given in parentheses.

Australia.—SYDNEY.—19th April. County Council. High voltage mobile testing equipment. (C.R.E. (I.B.) 54890/51. Ten/2191.)*

Bacup.—2nd April. Corporation. Street lighting equipment. (See this issue.)

Belfast.—30th March. Corporation. Replating lead-acid storage battery. (See this issue.)

Cuckfield.—22nd March. R.D.C. Installation of electricity in Council houses (See 2nd March issue.)

Egypt.—CAIRO.—26th March. Director-General, Electricity and Gas Administration. Supply and delivery of 250 and 660 V v.i.r. cables. (See this issue.)

Erith.—12th March. Borough Council. Two 5-in. centrifugal pumps, electric motors, switchgear, lighting fittings, etc. for main drainage scheme. J. H. Clayton, borough surveyor.

Gillingham, Kent.—28th March. Corporation. Electrical installations in 29 houses. (See this issue.)

Morocco.—TANGIER.—15th March. Administration Internationale de la Zone de Tangier. Hard copper cable. (C.R.E. (I.B.) 52836/51. Ten/2177.)*

New Zealand.—WELLINGTON.—8th May. State Hydro-Electric Department. One 80-ton electric overhead travelling crane. (C.R.E. (I.B.) 54261/51. Ten/2169.)*

South Africa.—DURBAN.—30th March. City Electricity Department. Outdoor switchgear and distribution switchboards. (C.R.E. (I.B.) 54500/51. Ten/2185.)*

Southern Rhodesia. — SALISBURY. — 22nd March. Electricity Supply Commission. Supply of transformers ranging from 5 kVA to 300 kVA. (C.R.E. (I.B.) 54546/51. Ten/2183.)*

Uruguay. — MONTEVIDEO. — 29th March. Usinas Electricas y Telefonos del Estado. Electricity meters and spares. (C.R.E. (I.B.) 53809/51. Ten/2186.)*

11th April. Substation equipment. (C.R.E. (I.B.) 54078/51. Ten/2171.)*

30th March. Ferrocarril Central del Uruguay. Supply of a locomobile diesel-electric crane. (C.R.E. (I.B.) 54093/51. Ten/2176.)*

*Specifications may be inspected at the Commercial Relations and Exports Department, Board of Trade, Thames House North, Millbank, S.W.1 (Victoria 9040).

CONTRACTS IN PROSPECT

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrical work is definitely included. Alleged inaccuracies should be reported to the Editors.

Bradford. — Nursery teachers' college (£300,000); Bernard Engle, architect, 8, New Square, Lincoln's Inn, W.C.2.

Brierley Hill.—Dwellings (114), Market Street, Kingswinford; J R. Moore, architect, Council Offices.

Bristol.—Warehouse premises, Castle Street and Tower Hill; Small & Parkes, Ltd., 18, High Street, S.W.19.

Primary school, Hallen Drive, Sea Mills; city architect.

Burnley.—Houses (24) and 28 flats, Brunshaw estate; borough engineer.

Police headquarters and magistrates' courts; Bradshaw, Gass & Hope, architects, 19, Silverwell Street, Bolton.

Cambridge. — Research laboratories and houses; Lanchester & Lodge, architects, 10, Woburn Square, W.C.1.

Cardiff.—Factory, Colchester Avenue; Industrial Precision Units, Ltd., 39/51, Cathays Terrace.

Carlisle.—Reconstruction of premises, Blackfriars Street; Binns, Ltd., English Street.

Terraced houses (90), Harraby; John Laing & Sons, Ltd., Dalston Road.

Carshalton.—Flats (60), Lynwood Avenue, for U.D.C.; E. H. Smith (Croydon), Ltd., 48, Wellesley Road, Croydon.

Chelmsford.—R.C. church, Melbourne Avenue; O'Neill & Fordham, architects, 65, Springfield Road.

Classroom block, St. Philip's Priory, London Road; T. G. Birchall Scott, architect, 110, Horseferry Road, S.W.1.

Cheltenham. — Rebuilding administrative offices, booking and waiting halls, etc.; Black & White Motorways, St. Margarets Hall.

Corringham (Essex).—Houses (134) and five shops and maisonnettes for Thurrock U.D.C.; surveyor, Council Offices, Grays.

Coseley (Staffs).—Houses (56), Batmans Hill site, for U.D.C.; K. E. Millard & Co., Ltd.

Crewe. — County library headquarters (£37,000) for Cheshire E.C.; E. M. Parkes, county architect, The Castle, Chester.

Cumberland.—Rural police stations at Humpton and Armathwaite; county architect, Portland Square, Carlisle.

Darlaston.—Houses (66), Bentley estate; G. R. Rowlands, clerk to U.D.C., Town Hall.

Douglas (Isle of Man).—Houses (162), second section of W. laston estate; borough engineer.

Dudley.—Adaptation of "The Woodlands" (£30,000); borough surveyor.

East Grinstead.—Rebuilding out-patients' dept. at Queen Victoria Hospital; South East Metropolitan Regional Hospital Board, 27, Queen Anne Street, W.1.

Folkestone.—Houses (40), Biggins Wood; borough surveyor, West Terrace.

Gateshead.—Houses (115), various sites, for the T.C.; J. Clark and Son, Ltd., builders, Seaham, Co. Durham.

Hastings.—Factory, Ponswood Road estate; F. Fryer & Co., Ltd., Orkney Street Works, S.W.11.

Heanor. — Additional factory premises; Aristoc, Ltd., North Street, Langley Mill.

Houses (80), Marlpool estate; R. Archer, U.D.C. surveyor.

Irthlingborough. — Further 38 houses, Addington Road estate; U.D.C. surveyor.

Kettering. — Fire brigade headquarters (£36,500) for Northants C.C.; county architect, Northampton.

Leeds.—Dwellings (44) at Tinshill estate for T.C.; Wm. Airey & Sons, Ltd., Eldon House, Leeds.

Leicester.—Works additions; British United Shoe Machinery Co., Union Works.

London.—PECKHAM.—Flats (16) and maisonnettes, Naylor Road, for Camberwell B.C.; borough engineer.

SOUTH NORWOOD.—Office block; Medico-Biological Laboratories, Ltd., Cargreen Road, S.E.25.

Melton Mowbray.—Maternity unit at infirmary; Pick, Everard, Keay & Gimson, architects, Millstone Lane, Leicester.

Morden.—Flats (72), Sutton By-pass and Green Lane, St. Helier, for L.C.C.; Kent & Sussex Contractors, Ltd., 109, Station Road, Sidcup.

Morecambe.—Flats (12), Warren Grove; J. Westwell, 11, Banksome Drive.

Newcastle-on-Tyne.—Factory and offices, Brinkburn Street, for the United Wire Works, Ltd.; Arthur & Kirkup, Swinburne Street, Gateshead-on-Tyne.

Houses (34), Shrigley Gardens, etc.; J. H. Fisher and Co., builders, Kenton Lane.

Northallerton.—Houses (70), Valley Road estate; U.D.C. surveyor.

Nottingham.—Stage 1 of new technical college at Burton Street; John Cawley, Ltd., 151, Canal Street.

Nuneaton.—Erection of St. Joseph's R.C. Secondary School; S. N. Cooke & Partners, architects, Sun Buildings, Bennetts Hill, Birmingham.

Pershore.—Houses (15), Albany Grounds estate, for R.D.C.; Perks Bros., Eckington, Pershore.

Peterhead.—Extensions to canning factory (£23,000); Crosse & Blackwell, Ltd., Kirk Square.

Silsoe (Beds).—Agricultural institute at West End Farm; county architect, Shire Hall, Bedford.

Smethwick.—Junior school, Salford Lane; G. Randle & Son, architects, 116, High Street.

Southampton.—Rebuilding premises, Above Bar; Southern Newspapers, Ltd.

South Shields.—Houses (124) at Simonside; borough engineer.

Stamford.—Houses (54), Drift Road estate; borough surveyor.

Stockport.—Erection of Reddish Vale Infants' School; Roy & Partners, 25, Cross Street, Manchester.

Sunderland.—Residential hostel, Thorney Close estate (£21,000); G. H. Plemper, Ltd., builders, Old Chester Road.

Twelve police houses; borough architect, Grange House, Stockton Road.

New church of St. Mary the Virgin at Humbledon; George Henderson, builder, East Boldon, Co. Durham.

Houses (14) and communal centre at Hill View for old people (£24,000); borough architect, Grange House, Stockton Road.

Swansea.—Research laboratory at Hill House Hospital; Medical Research Council, 38, Old Queen Street, S.W.1.

Houses (69), Penlan estate; borough architect.

Tamworth. — Houses (66), Kingsbury (£83,889); R.D.C. surveyor.

Taunton.—Houses (100), Bridgwater Road; borough housing architect.

Torquay.—Flats (16), Meadfoot Road, and six at Parkhill Road; Thomas Vanstone & Sons, 240, Higher Union Street.

Urmston.—Dwellings (83) at Woodsend Road estate for U.D.C.; J. Maunders & Son, 554, Barton Road, Stretford.

Uttoxeter.—Houses (46), Bentley estate; S. S. Proud, U.D.C. surveyor.

Wakefield.—Bus station for West Riding Automobile Co., Ltd. (£64,000); James Miller & Partners, Ltd., Newmillerdam, Wakefield.

Warrington.—Rebuilding factory, John Street; Winwick Street Tanning Co.

Watford.—Extensions to factory, Whippendell Road; Sun Printers, Ltd., 52, Long Acre, London, W.C.2.

Factory, Lower High Street; Henry H. Butterfield, Ltd., 55, Southern Road.

Wigan.—Branch college of further education (£172,400 for first section); A. Royle, town clerk, Municipal Buildings, Library Street.

Worcester.—Extensive alterations to The Firs, Whittington, for children's nursery; Willis, Llewellyn, Smith & Waters, architects, Britannia Square, Worcester.

Worsley.—Houses (118), Little Hulton Neighbourhood Unit; H. Lomax, clerk to U.D.C., Town Hall, Walkden, Manchester.